THE AMERICAN GAS LIGHT JOURNAL

REDMANKENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXVII.—No. 4. Whole No. 1,416. | NEW YORK, MONDAY, JULY 28, 1902. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 42 Pine Street, New York.

Telephone.—2996 John.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $5 (£1—25 francs). All payments to be made in advance. Single copies, 10 cents.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligen discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Remittances should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C. O. D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

EDITORIALS—

Briefly Told 109

Mr. A. C. Humphreys Accepts the Presidency of the Stevens Institute —Notes.

Niagara Developments. 110

*Enrichment of Gas by Benzol 110

*Notes on the Industrial Use of Gas Works Coke, by M. Alex. Lencauchez 111

American Coal and French Market 114

*A High Potential Direct Current Plant for Experimental Work, by Mr. G. S. Moler 114

*Acetylene Mine Lamps: Some Comparisons 115

The Duties of Engineers in Enforcing Contracts, by Mr. A. J. Hines 116

Boiler Bracing.—No. II.—By Mr. W. H. Wakeman 117

SPECIAL ENGLISH CORRESPONDENCE 118

The Gas Institute Meeting—Illuminations for the Coronation.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 119

Sale of the Pomona (Cal.) Plant—Extensions at Alton, Ills.—A Circular Respecting the Promised Rate War, Auburn, N. Y.—Annual Meeting, Ogden Company, Chicago—A Legal Decision—Something About the Boston Company's Properties—Proposed Gas Company for Nescopeck, Pa.—Annual Meeting. Albany, N. Y.—Ditto, Cadillac, Mich.—Proposed Company for West Seneca, N. Y.—Executive Management, Louisville (Ky.) Company—Another Decision—The Orange County (N. Y.) Gas and Electric Light Company—And Other Items

New Reversible Pneumatic Drill 120

The Market for Gas Securities 121

BRIEFLY TOLD.

MR. A. C. HUMPHREYS ACCEPTS THE PRESIDENCY OF THE STEVENS INSTITUTE.—Mr. A. C. Humphreys has formally accepted the presidency of the Stevens Institute, Hoboken, N. J., the offer of which position was made to him by the Trustees of the Institute shortly after the death of the man whose scholarly and practical methods caused the fame of Stevens Institute to be known throughout the world—Henry Morton. Mr. Humphreys will continue and maintain his active business relations with the firm of Humphreys & Glasgow.

NOTES.——

THE contest for control in the executive management of the Consolidated Gas Company, of Baltimore, resulted in the success of those opposed to adopting the ticket named by the existing officials. The total vote represented 82,556 shares, of which 54,672 went to the opposition, 26,924 were cast for the regular ticket, and 960 were of the split order. The successful ticket carried the following names: H. C. Black, Michael Stern, James A. Gary, Fred. W. Wood, John A. Whitridge, Chas. T. Crane, Townsend Scott, Thos. O'Neill, Ferd. C. Latrobe, Daniel C. Ammidon, Chas. H. Dickey and Ernst Schmeisser. The completeness of the victory astonished even the victors. General Latrobe will continue to direct the affairs of the Company as President, and it is the avowed purpose of the men now in control to substitute modern methods in the sales' departments of the Company for the rather slow system that prevailed prior to 1901. In his verbal report to the shareholders, regarding the business done by the Company for the past year, President Latrobe noted that the gain in output over the preceding year was 8.21 per cent., and that the increase in placed fuel appliances for the like period, represented in percentage, was 46. The latter shows how sensible, persistent work, of the sort initiated in Baltimore by Mr. Frank D. Moses, in 1901, can be made to pay. We note, however, that President Latrobe seems to favor coke oven gas from "the coming" coke oven plant at Sparrow's Point; but the General should wisely bear in mind that making coke and making gas may not successfully go hand in hand towards a common point. In other words, either product must be a residual; and as it would seem that there is more profit in gas in a big city at, say, 75 cents to $1 per 1,000 cubic feet, than in coke at so much per ton, it might be the part of safety for gas men to make gas and coke in the good, old way, always keeping in their direct custody the manufacture of both.

AT the annual meeting of the Directors of the Northampton (Mass.) Gas Light Company the following officers were elected: Directors, John F. Starr, L. C. Seelye, C. M. Clark, E. H. Bannister and H. C. Crafts; President, C. M. Clark; Clerk and Treasurer, E. H. Bannister; Assistant Treasurer, R. M. Starkweather; Superintendent, H. C. Crafts. The reports for the year showed a notable gain in the Company's business. A semi-annual dividend of 4 per cent. was declared.

THE Directors of the Newburyport (Mass.) Gas and Electric Company have recommended to the shareholders that an offer of $120 per share for their holdings be accepted. The Directors offer as a reason for the indorsement of the offer that in a short time, if the plant is retained by its present owners, it will be necessary to expend from $60,000 to $75,000 on it so as to put it in position to respond satisfactorily to the demands for more light that are being made upon it. But is such

LIBRARY OF CONGRESS. JUL 28 1902

statement not either one of two things—that the present executive management is not competent to care for an extension of business, or that the people who are to pay the $120 per share for the stock are not financially wise. As between the named horns we would rather take our chances with the purchasers.

THE authorities of Fremont, O., seem still to be possessed of that liberality which formerly marked many of its "first citizens." At least we so hold from a line or two recently forwarded by a correspondent at that point. He said that at a special meeting of the City Council it was decided to invite the proprietors of the Logan Natural Gas Company to "distribute" gas in Fremont, provided the Company would agree to sell its product at 35 cents per 1,000 cubic feet, to make no charge for putting in services and meters, and to furnish gas for lighting, heating, etc., to the public buildings, free of charge. At last accounts the Company declined to do business in Fremont.

ANOTHER evidence of the municipal desire to secure something for very little is furnished in a "resolve" adopted a few days ago by the Assembly, of St. Paul, Minn. The wording of the resolution was this: "*Resolved*, That we request the Gas Company to furnish $1 gas." In the debate that followed the introduction of the measure, Assemblyman Wheeler asked the Corporation Counsel if the Assembly could not "order the Gas Company to do this?" The Corporation Counsel's reply was "Yes, you can order all you please." Which would seem to imply that the lawyer thought there was some difference between ordering and receiving.

THE Pawtucket (R. I.) Gas Company has issued a collateral mortgage amounting to $2,000,000, the Trustee of which is the Slater Trust Company, of Pawtucket. The interest rate is 4 per cent. per annum, and the mortgage is to live for 30 years.

IN addition to our former mention of the incorporation of the Capital City Gas Company, of Montpelier, Vt., we may say that the proprietors have arranged for the construction of the plant. The contracts so far as awarded, include: A storage holder, of 40,000 cubic feet capacity, by Messrs. Deily & Fowler, of Philadelphia; scrubbers, condensers and purifiers, by the Oswego (N. Y.) Boiler Works; and exhauster, by the Connersville (Ind.) Blower Company, and main pipe by the National Tube Works. Two benches of 6's are to be installed, an a small water gas set will also be placed. It is planned to carry 3 pounds pressure on the street mains, the pressure to be reduced at the consumers' meters to the requisite point. The officers of the Company are: President, J. Warren Lamb; Vice-President, A. C. Blanchard; Clerk and Treasurer, F. M. Smith; General Manager, George L. Blanchard; Superintendent, G. Falkenstein.

Niagara Developments.

The *Electrical World* notes that a notable and important step in connection with the power development at Niagara Falls has been taken by the Niagara Falls Hydraulic Power and Manufacturing Company in the purchase of a large tract of land in the northeast part of the city, where a new industrial center will be established by that Company, its present lands being well occupied by manufacturing plants. Electric power will be transmitted to the newly acquired territory, and Niagara Falls will soon have great factories on its northern as well as on its southern outskirts.

The first large industry to seek this new section will be the Carter-Crume Company. This Company has purchased 5 acres in the same portion of the city and will at once erect a large factory building for the manufacture of counter check books. The buildings will cover about 4 acres. The Carter-Crume Company now has a large establishment on Main street, and is a power customer of the Niagara Falls Hydraulic Power and Manufacturing Company. It now employs about 300 hands, but this number will be increased in the new plant, which will go forward at once.

When the Carter-Crume Company vacates its present large buildings they are to be occupied by the William A. Rogers, Ltd., manufacturers of hollow ware. This Company has a plant adjoining the Carter-Crume Company, and when it secures its additional space the Company's other plants, in Northampton and New Bedford, Mass., as well as in Oneida, N. Y., will all be moved to Niagara Falls.

The Atmospheric Products Company has broken ground on the lands of the Niagara Falls Power Company, for a building that is to be 125 x 50 feet, two stories high, and of pressed brick. In this building the apparatus necessary to equip a second building to be 500 x 50 feet at the foundation will be made. The first building will be close by the aluminum plant, but the site of the second building is yet to be selected. The Atmospheric Products Company will use air as its raw material.

Enrichment of Gas by Benzol.[1]

[A paper read by MR. A. LECOMTE, of Paris, before the Société Technique du Gaz en France.]

My paper of last year dealt with the rules of enrichment of coal gas by benzol, and concluded with a review of the apparatus employed for the purpose. In the following communication, I describe two installations, making 500 and 2,500 cubic meters (17,600 and 88,300 cubic feet) per day respectively, with which a number of tests have been made. In the first of these (Fig. 1), at the gas works at Andresy-Fin d'Oise, the gas is separated into two streams by a "divider" *A*, fitted with a regulator *R* at its inlet valve *F*. A lead pipe p^1p^2 takes $\frac{2}{3}\frac{3}{3}$ths, and a second tube $d_1d_2d_3d_4$ $\frac{1}{3}\frac{1}{3}$th of the total gas. The divider consists essentially of a rigid rod carrying two disks; *dp* measures the main stream of gas, and *dd* the smaller current. These two disks rise and fall at the center of two cones, of which the angle is such that the sectional area of passage between the disks always remains the same. The free space in *dd* is always $\frac{1}{3}\frac{1}{3}$th, that in *dp* $\frac{3}{3}\frac{2}{3}$th of the entire area. The arrangement is balanced by a float; and bells working in oil baths serve to separate the main from the smaller stream of gas. A tuyere at the side equalizes the pressure of the gas; and the mounting of the rod between rollers renders the whole very mobile.

The action of the apparatus is easily seen. The gas coming from p_1 raises the disk *dp*, in order to pass between it and the cone; and the annular space between the disk and the cone will be such that the speed of the passing gas corresponds to the pressure of the water, resulting from the weight of the disk. If the disk *dp* has a surface of 125 square centimeters, and it is desired to reduce the pressure by 3 millimeters (0.12 inch), all that is needed is to place on the upper part of the divider a weight of 37.5 grammes, and the position of the disk *dp* in the cone will always be such that the gas passes at a speed corresponding to the pressure thus diminished by 3 mm. But the small disk *dd* will have its position in the upper cone such that the surface exposed to the gas represents $\frac{1}{4}$th of the annular surface opened by the large disk—*i. e.*, $\frac{1}{3}\frac{1}{3}$th of the total; and if the gas arrives in d_3 with a pressure (say) 3 mm. greater than that in d_4 or in the exit pipe, the gas having the same speed as that which passes through the large disk, the volumes of the main and secondary gases will be proportional to the sections of the disks. Hence the quantity of gas passing the meter *C* will be $\frac{1}{3}\frac{1}{3}$th of the whole, from which the total volume of the gas is ascertained. The regulator *B* should have its bell equipoised; any difference of pressure produced by the immersed bell affecting the accuracy of the readings. I will consider later the results obtained with the apparatus.

The bell divider above described is a simple, workmanlike apparatus, very suitable for small makes of gas. The only objection to it is that the co-efficient of contraction of the gaseous stream varies with the position of the disk; producing an error which, in the case of large makes, may rise to an important amount. The Société des Huiles Minérales de Colombes has contrived a divider free from this defect. The one I describe here is for a make of 2,500 cubic meters per day of 24 hours, and has been in constant use for 8 months past in the works at Beaune (Côte d'Or). The details of the apparatus, which, in the main, are similar to those already described, are shown in Fig. 2; the lettering being the same as in Fig. 1. The only difference is in the divider, which consists of a cylindrical perforated bell, with siphon compensator. The gas is divided, so that the meter *C* registers $\frac{1}{7}\frac{1}{5}$th of the total. The bell is divided into two compartments—a large one p_1 for the passage of the gas going to the regulator, and a smaller one d_4 for the gas coming from d_3, which latter passes $\frac{1}{7}\frac{1}{5}$th of the total. The bell is balanced with such a weight as will cause the gas to emerge from the perforations at a pressure 3 mm. less than normal. The gas from d_4 actuates the meter and passes through the differential regulator *B*, which is adjusted to deliver the gas at d_3 with a pressure 3 mm. greater than that existing above the bell in p_4. As the gas traverses the two compartments at the same speed, the ratio of the volumes is that of the total areas of the perforations in the respective compartments; and as each perforation is always working under the same conditions, the co-efficient of contraction of the gaseous current remains constant. A layer of heavy oil is used on the water in the apparatus, to prevent evaporation. *D* is the benzol distributer, fed by a constant level regulator D^1; and *E* is the vaporizer, which is heated to 100° C. by exhaust steam. The meter shows the total quantity of gas passed per minute, and a further accessory records the number of grammes of benzol per cubic meter of gas. The weight of benzol can thus be increased or diminished as indicated beforehand by photometric tests.

1. Translated for *Journal of Gas Lighting*.

The experiments made with these two pieces of apparatus by the writer, in conjunction with MM. Meugnot and Desvignes, and MM. Delcourt and Chemardin, gave these general results:

1. The effect of carburetting does not appear until 15 minutes after starting the apparatus.

2. Five months' working in winter shows that naphthaline is almost completely kept down with 3 to 5 grammes of benzol per cubic meter.

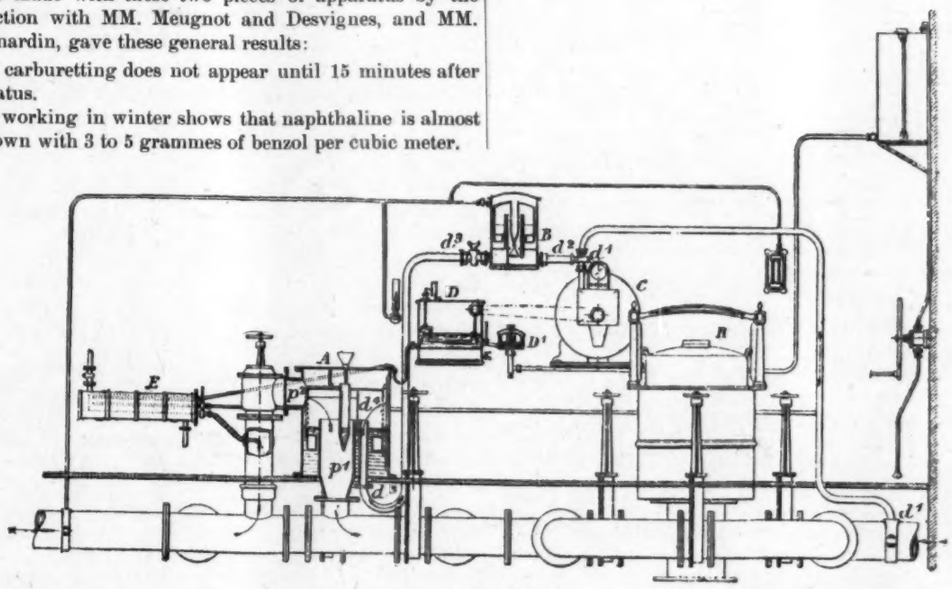


Fig. 1.

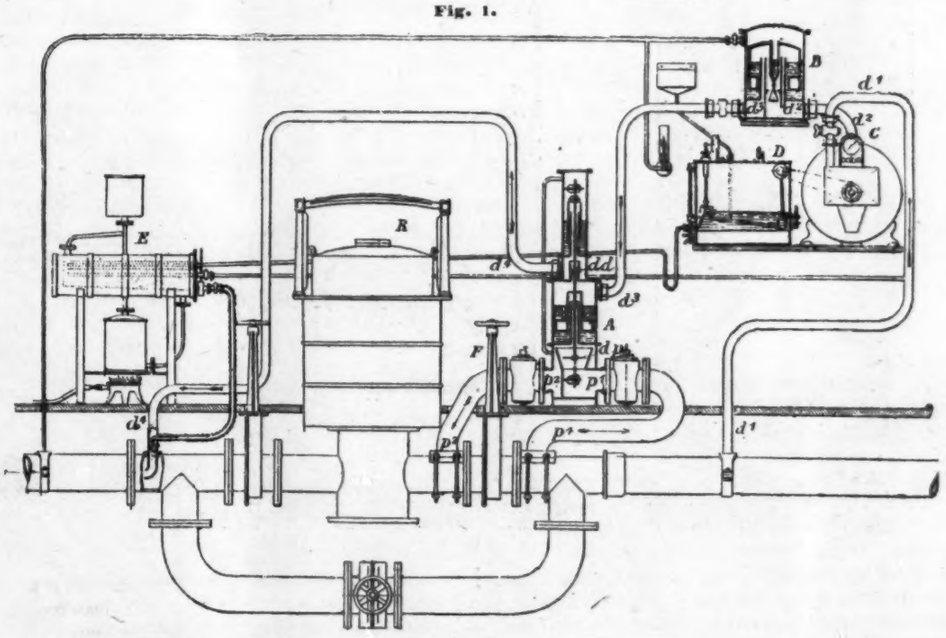


Fig. 2.

3. No action of the benzol on india rubber joints could be traced.

4. As much as 30 grammes of 90 per cent. benzol per cubic meter can be taken up without any abnormal behavior of the ordinary or incandescent burners being noticed.

5. The apparatus requires from 10 to 12 mm. ($\frac{4}{10}$ths to $\frac{5}{10}$ths) pressure.

6. The output of gas can vary 40 per cent. without any alteration in its illuminating power; benzol proportional to the volume passing being, of course, introduced.

In conclusion, I may record, in tabular form, some comparative photometric results (in liters) obtained with the Dumas and Regnault photometer and with the Giroud apparatus:

Giroud.	Dumas and Regnault.	Giroud.	Dumas and Regnault.	Giroud	Dumas and Regnault.
97.....	96.0	103.....	103.6	109.....	112.6
98	97.0	104.....	105.0	110.....	114.4
99.....	98.4	105.....	106.4	111.....	116.6
100.....	99.7	106.....	107.8	112.....	119.2
101.....	101.0	107.....	109.3	113.	123.6
102	102.4	108	110.8		

As a general rule, the Giroud apparatus gives higher readings than the Dumas and Regnault below 100, after which its readings are lower than the latter. It should be mentioned also that the carbureter of the Société des Huiles Minérales de Colombes is very suitable for the enrichment of a mixture of oil gas and water gas. A mixture containing 25 per cent. of water gas will not yield, on the average, more than 20 grammes (300 grains) of benzol per cubic meter (35.3 cubic feet).

Notes on the Industrial Use of Gas Works Coke.[1]

[Read by M. Alexandre Lencauchez, at the last meeting of the Société Technique du Gaz en France.]

Coke as it comes from the retorts may for some industrial purposes be used direct; but generally it needs to be sorted out. Only producers some 20 to 26 feet high could properly use it just as it came—lumps, dust and all.

Domestic heating purposes—which do not come within the scope of the present paper—have compelled the gas companies to sort their coke out into different sizes, from 4-inch lumps to fine dust. The ordinary classification (in France) is Nos. 2, 1, 0, 00, nuts (1.0-inch to 0.6 inch), breeze (0.6-inch to 0.2-inch), and dust (from 0.2-inch down to flour). Dust can be slowly burned in Malétra, Michel Perret and other stoves, and steam can be slowly raised by coke dust with multitubular boilers producing only 11 to 13 pounds of steam per 10 square feet per hour instead of 33 to 44 pounds. In the latter case 1¼ tons of coke dust will do

1. Translation, from the *Gas World*.

about as much work as 1 ton of coal, and the wages come to about 86.4 cents per ton of coal (one day of 10 hours), as against $1.35 per ton of coke dust. At usual prices in France ($5.76 per ton for coal, $1.54 per ton for coke dust) the coke dust will show a saving of $1.58 a day on an 80 horse power steam engine, which saving is much greater when the horse power is greater and the wages proportionately less important.

How to Burn Gas Coke.—1. Sizes 2 and 1 (4 inches and 3 inches).—These sizes burn well in deep fire boxes (Paris suburban locomotives) in masses 12 to 14 inches deep, with an air supply of from 12 to 15 pounds of air per pound of coke. There is a considerable margin, for very nearly the same steam is raised even when the air supply rises to 24 pounds per pound of coke.

2. Sizes 0 and 00 can be burned on fire bars from 0.6 to 1 inch apart, in masses 6 to 7.2 inches deep.

3. Nuts require fire bars 0.32 to 0.4 inch apart, a depth of 3.6 to 4.8 inches, and a good chimney draught.

4 Breeze and dust require, not fire bars but perforated iron plates with holes from 0.12 to 0.2 inch at top, widening downwards; a fuel depth of 2.4 to 4 inches; and when the coke can run through less than 0.4-inch mesh, chimney draught is not sufficient. In that case there must be a fan or a steam injector.

If the dust is very fine, even perforated iron plates will not suffice; there must also be a double arch, as in Fig. 1. This double arch sends in secondary heated air which catches up the extremely fine dust displaced from below by the blast and burns it as if it were a gas. It also acts as a heat accumulator during the stoking. There is a good deal of cinder formed; so there ought to be very free access to the interior, and a large space for the deposition of cinder dust from the flames. Burning coke dust is not advisable as a general rule, and the experiments made in Germany, from 1894 to 1898, did not come to much, any more than the similar experiments of Decazeville, from 1848 to 1850, and of Crampton, from 1870 to 1875, did. The reason apparently was that there was too much cinder dust. But when we have, as in gas works, great quantities of coke dust to get rid of, the plant shown in Fig. 1 enables us to get rid of it usefully and advantageously.

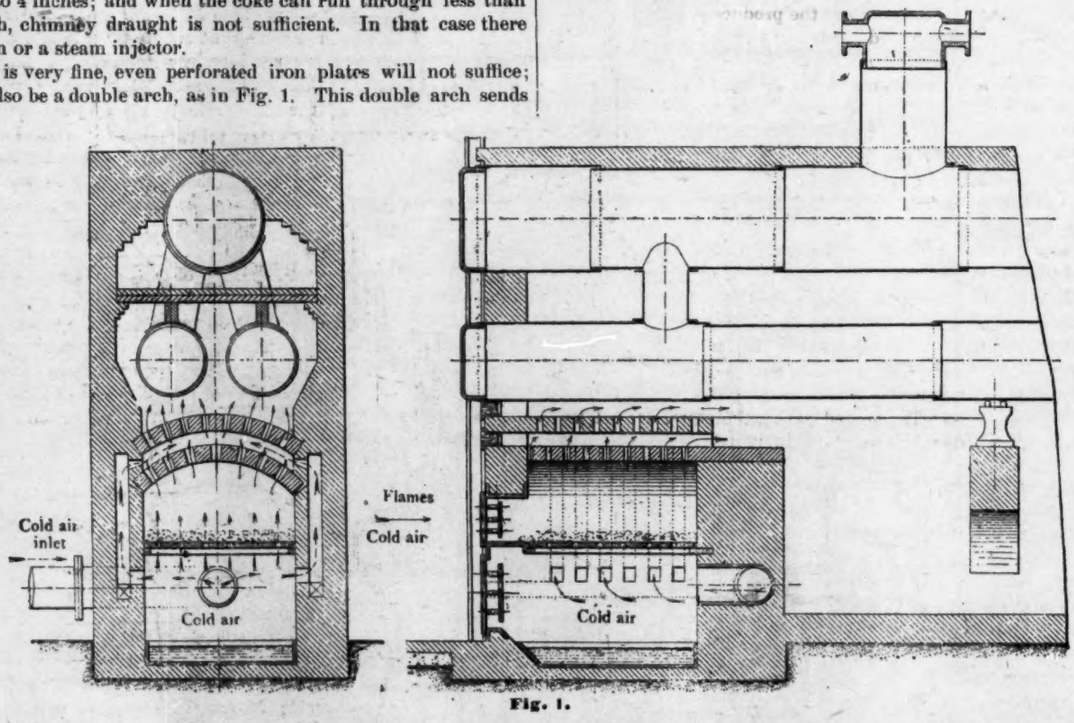


Fig. 1.

Heating Water and Raising Steam for Heating Purposes.—Even coke dust is useful for this; but with larger sized coke a large, tall reservoir may be used, the so-called Salamander, for example, which is really a true gas producer. The gas burns at the top of the coke. The supply with gentle draught is enough for 24 or even 48 hours, and all the attention that is needed is to shake the grating now and again and to see that the heat does not rise too high and melt the ashes. For gas coke the height should be about twice as great as for anthracite.

Gas Coke for Steam Raising Generally.—The larger sizes, Nos. 0 to 2, are decidedly better than coal for this purpose. Experiments made by the author on a large scale, and over a long period in 1883, showed that while coal (Pas-de-Calais) raised 6.453 pounds of steam per pound, or 7.415 pounds per pound of dry and ashless coal, coke (Paris Company No. 2) raised 7.10 pounds of steam per pound, or 8.516 pounds of steam per pound of dry, ashless coke, the advantage in favor of the coke being thus about 13 per cent, This advantage is due to loss of coal dust in the draught and through the hearth, and also to the better distribution of the air as it passed through the coke, which did not cake as the coal did. The Say sugar refinery in Paris uses 200 tons of fuel a day. This consists of 45 to 60 per cent. of coke dust and small breeze mixed with more or less binding coal. The combustion is slow and regular, and the steam raised is limited to about 11 to 15 pounds per 10 square feet per hour. It is found that this method takes full advantage of all the heating power of the coke as well as of the coal.

Direct Use of Gas Coke in Various Industries.—Many blast furnaces use gas coke. They require, however, a good, hard-ringing coke which can stand a heavy weight; and they generally use No. 2 coke mixed with coke oven coke in the proportion of 20 to 60 per cent., according to the prices current. The Paris Company sell a great deal of coke to blast furnaces, and the Marseilles Gas Company, who are the proprietors of blast furnaces, use regularly from 45 to 60 per cent. of their own coke in these. Bordeaux gas coke is in great demand for use in the proportion of one-third in blast furnaces. Gas coke is also good for smithy work.

In making lime and molded bricks coke is almost essential for better class products, since there is contact between the things heated and the products of combustion. In making cement, gas coke and coke oven coke are about equally good; the Boulogne Portland Cement Works use a good deal of gas coke.

References to experiments—Gérôme and Audouin ("Journal des Usines à Gaz," 1894, pp. 9-10); Weber, for the Mulhausen Industrial Society (the same Journal, 1895, pp. 237-241); all go to show that coke is better than coal under a boiler at the same price per unit of intrinsic heating power; much more so when the heat units in the coke are cheaper. The difference is something like that between burning charcoal and burning wood.

Gas Coke for Making Producer Gas.—The Paris Gas Company have used part of the coke for this purpose since 1883, in order to heat their retorts. The French Metal Company, at St. Denis, use it for 26 furnaces for refining, melting, etc. At Bordeaux it has been long used in three glassworks (now two). The Say sugar refinery has used it for calcining carbonate of strontia. In the furnaces referred to, platinum and silica have been melted, which is enough to indicate the temperatures that have been attained by gas firing and recuperation. At the Say works it was found that 82 tons of coke corresponded to 100 tons of coal. In iron and steel working the gas is said to be "too dry" (not enough H_2O in the products), and therefore to oxidize the metal and make it brittle; but this defect has been got rid of by partially making water gas. Coke gas is in use for producing sulphate of barium, and also for the manufacture of liquid carbonic acid from the products of combustion.

It used to be the practice to put water in the ashes below the grate.

This produced some CO and H as the steam ascended between the bars. But this was too irregular; and now a regulated supply of steam is sent in, and then either coke of a smaller size (No. 0) is employed, or the depth of coke is increased in order to insure a complete decomposition of the steam supplied. This enables the gas to be produced with a very steady percentage, 10 to 11, of hydrogen; and for metallurgical purposes this hydrogen very advantageously replaces the hydrocarbons present in producer gas made from coal.

Influence of Steam upon the Fusibility of Clinker in Producers.—When air is used without steam in a producer, the fire bars are near to a very high temperature, for CO_2 is being produced, and the temperature may rise beyond 2,550° F. The ash is then fused and turned into a mass which is very difficult to remove. Some have tried to push the temperatures so as to make this run right out; but that is physically impossible, for the simple reason that, while in a blast furnace the hot metal rains down and keeps the slag hot, in a producer the air as it rushes in brings the temperature down and solidifies any melted product that may have come down. Where the ash contains iron it may frit the infusible silicious and calcareous materials and make them stick together so that they form masses almost impossible to remove. Even if they could be fused right out, this would mean a tremendous waste of heat, especially in cases where the producers were not directly connected to the furnaces supplied by them; and the gas would be very "dry" (without hydrogen) and relatively poor. It is possible to introduce steam in such a proportion as to oxidize half the carbon burned; and if this be done the temperature can be kept down to, say, 1,470° (with 10 or 12 per cent. CO_2 in the gas produced) for very fusible ash, or to 2,012° F. (with 6 or 7 per cent. CO_2) for ash less easily fused. When steam is used the temperature at the bottom is so far under control that the ash can be kept unfused; and this enables gas coke breeze to be used containing as much as 35 per cent. of ash. This material would otherwise go to waste and cumber the ground. Without steam we get H 2.10, CO 27.30, CH_4 0.15, C_2H_4 0.05, CO_2 3.50, N 66.90; calorific value, 113 per cubic foot; temperature of gas, 2,010° to 2,100° F. With steam as above, we get H 26.55, CO 18.29, CH_4 0.20, C_2H_4 0.06, CO_2 11.35, N 43.55. calorific value, 160; temperature of gas, 1,200° to 1,290° F. If the former of these goes on direct into the furnace it carries 42 extra heat units with it, making 155 in all; if the latter does so, its total is 174. The mixed gas is, therefore, not markedly better than the gas produced without steam if it is to be used direct; but if it is to be used at a distance it entails a markedly smaller loss of heat.

Gas Coke in Producers with Air and Steam at 480° F.—The two types of producers, hearth and hydraulic seal, were described with drawings. The larger the coke, the taller should the column be, 20 feet with coke No. 2, 13 feet with breeze. If breeze be used there should, with the former type, be two producers, so as to allow for cleaning out the ashes. The latter type does not require any interruptions. A hot steam and air blast acts as a dry gas and gives no trouble. The composition of the gas produced remains very constant, and at 480° F. enough heat is carried in to increase the yield by 20 per cent. The percentage of hydrogen in the gas produced is about 30, that of CO 21.5, and that of CO_2 13.75, a mixture extremely suitable for metallurgical processes. It is easy to keep the temperature about the fire bars or perforated plates down below 1,830° F., and thus prevent slagging.

Purification of the Gas Made from Gas Coke.—Dust is an enemy to be fought against, particularly when the gas is made from dusty breeze. The best dust washer known is that shown in Fig. 2, a double fan with opposite rotations. The gas way is first narrowed to increase the speed of the gas, then widened out.

Through the fans the speed of the gas is about 167 to 200 feet a second. On its way through the fans the gas receives about twice its weight of water spray, and this spray and the gas are well pounded together. The result is that the dust is carried off by the water as a milky mud. The dust from coke is much more manageable than might have been expected. In blast furnace gases the annoyance from dust has been such that not much more than one-third the heating value of the gas has as yet been utilized. When the gas is less dusty simpler washing plant will do; but there must be a fan and spray; coke columns, falling spray and the like are of no use. A fan with 2 cubic feet of water per 1,000 cubic feet of gas cleans out the dust much more effectively than 50 filtrations in coke scrubbers with 10 times as much water. But such energetic fanning tends to produce a great diminution of pressure behind the fan, which is dangerous; so that a by-pass arrangement must be applied to let some gas go back behind the fan. If no gas is being consumed the fan, if in action, will then go on washing the same gas over and over. If the fan stops while the gas is passing, the gas will simply go forward through the fan and also through the by-pass. The gases being hot, this washing makes them take up a great quantity of water, which must be allowed to condense.

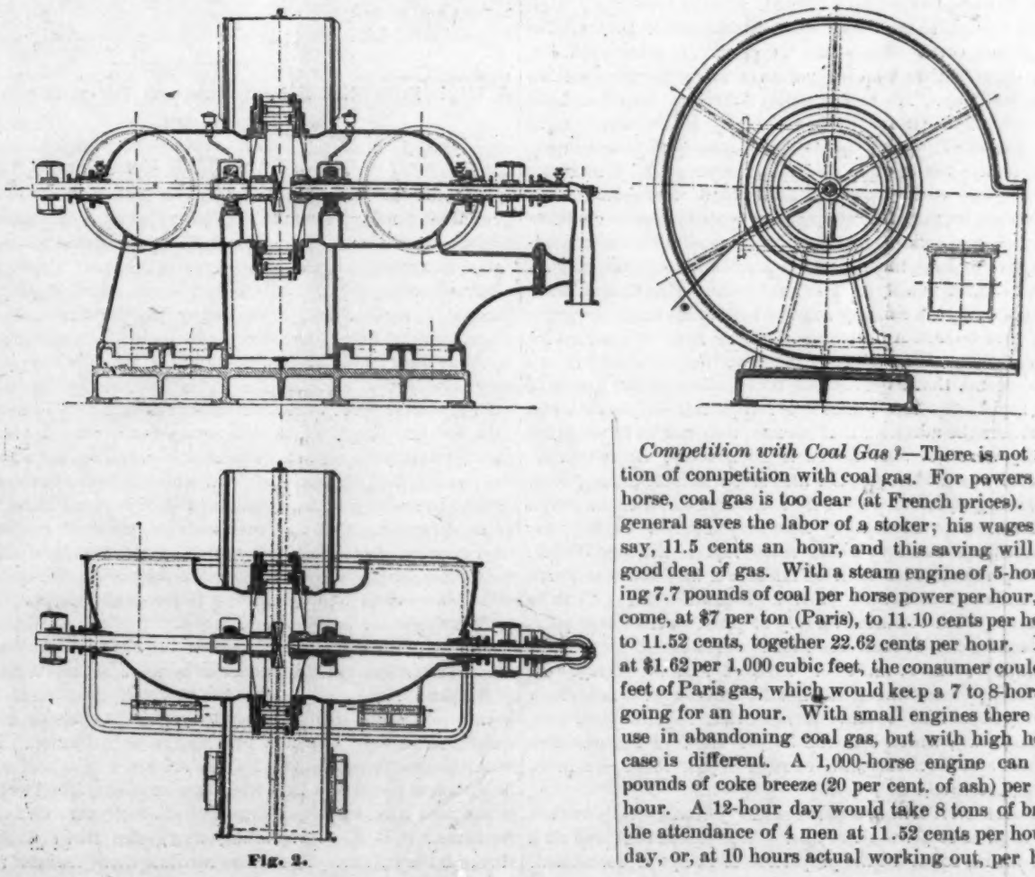


Fig. 2.

Competition with Coal Gas.—There is not really any question of competition with coal gas. For powers beyond 15 to 20-horse, coal gas is too dear (at French prices). A gas engine in general saves the labor of a stoker; his wages would come to, say, 11.5 cents an hour, and this saving will itself pay for a good deal of gas. With a steam engine of 5-horse power, burning 7.7 pounds of coal per horse power per hour, the coal would come, at $7 per ton (Paris), to 11.10 cents per hour and the man to 11.52 cents, together 22.62 cents per hour. For this money, at $1.62 per 1,000 cubic feet, the consumer could get 138.6 cubic feet of Paris gas, which would keep a 7 to 8-horse power engine going for an hour. With small engines there is, therefore, no use in abandoning coal gas, but with high horse powers the case is different. A 1,000-horse engine can be run at 1.46 pounds of coke breeze (20 per cent. of ash) per horse power per hour. A 12-hour day would take 8 tons of breeze at $3, and the attendance of 4 men at 11.52 cents per hour, total $27.65 a day, or, at 10 hours actual working out, per horse power per

hour, about one-tenth what coal gas would cost. Where the gas works comes in is that it has in its own hands the means of supplying power at extremely low rates. For example, a gas works can run an electric station far more cheaply than anybody else can, not necessarily for electric lighting, which is too dear, but for tramways, power, electro-chemical work, and so on. For such reasons gas works have an additional interest in promoting the use of gas by day for domestic heating purposes, so that they may have plenty of coke. The dust is good for raising steam and the breeze for making motor gas.

Tar Carried by Gas.—Tar is difficult to remove. If we wash the gas in hot water the tar froths and is carried forward. If we cool the gas suddenly the tar forms minute bubbles, like soap bubbles, which float on through scrubbers and coke columns without being stopped and which will remain for days in gasholders and pipes without settling down in the least. Everything may appear quite clean, and yet this tar may be deposited when it meets the heat in the gas furnace. The proper treatment is to consider these floating bubbles as impalpable dust and to spray the gas as it goes through fans. The same water is used over and over, being allowed time to settle. This treatment alone, with one scrubber coke column, cleans the tar out better than any imaginable system of condensers, refrigerators or coke towers will do.

Coke gas is chemically purified in ordinary gas works purifiers with the greatest ease, but the fine dust and the tar vesicles go right through the purifying material and pass on.

Miscellaneous.—The making of gas of as high a heating value as 188 heat units per cubic foot is not essentially economical, but is very convenient. The hot blast required entails an extra expenditure of fuel which neutralizes the economy, but the action is regular and uniform, and fuel can be used with it which could not be used with cold air.

Large motors using coke gas offer gas works a prospect of a steady market for coke, in which long contracts may be made; and that for all qualities of coke, even dust.

The exhaust of a gas producer may be worked by the gas engine which it feeds; and this combination is very advantageous for the user of small engines. Since no gasholder is required, the producer may be safely put in any convenient place.

American Coal and French Market.

In a recent consular report it is reported that the fact that much of the fuel used in France has to be imported, at an exceedingly high price, has led the French to make minute calculations of the relative value of the various combustibles they employ. In some localities, there is a strong conservatism which opposes the use of any product unknown in a practical way. The result is that American coal has been looked upon with more or less suspicion and many unfavorable prejudices have been created (1) by first appearances, due to the ignorance of our exporters as to the needs of the French market; (2) by analyses which, theoretically, showed a too small percentage of carbon and too much volatile matter, judging from experience with European coals.

It has been found in practice, however, that to some degree appearances were deceptive and the theory incorrect, as shown by the opinions of seven persons as to the quality of American coal. These persons are either highly connected with railway lines or with large manufacturing concerns which have burned American coal. The first claimed that it was inferior in calorific force, as compared with newly mined South Wales coal; the second, that he found the combustion in the grates of his factory too rapid; the third, that the lumps fell to pieces when touched by the stoker (he admitted that his men may not have made the most of it, as they were not accustomed to such coal); the fourth declared that the coal was too friable; the fifth stated that for locomotives, other conditions being equal, there was no noticeable difference between the samples of American coal tried by him and the best Cardiff; the sixth was persuaded that this coal could easily replace the best Welsh; while the seventh person had learned that American fine coal was worth 10 per cent. more than than Cardiff "menu," because it did not run to fine dust when broken, but consisted largely of particles the size of peas.

The French classification of coal used here is as follows:

(1) "Tout venant" ("run-of-mine" or "through and through"). To the French purchaser, the signification is not the same as to the American seller; it means here coal that contains not more than 30 per cent. of fine.

(2) "Menu" (fine coal), which contains 30 per cent. of lumps. The rest consists of dust and particles small enough to pass through a mesh of 25 millimeters (0.98 inch).

American coal on its arrival in France, has usually been so badly broken as to contain as high as 85 per cent. of fine. This places our coal on a par with Cardiff menu, so far as the proportion of lumps is concerned.

The prices are determined by classification and quality. As the general opinion of the railroads is that the quality is of the best, there remains only the question of classification. One railroad officer writes me that "the price should not exceed at any time that of Cardiff coal, quality being equal."

If American mine owners are content to sell their coals as menu in France, they can easily secure the market, but the buying price is low. One railroad official tells me that his company recently purchased 115,000 tons of menu at 15.50 francs ($2.99) the ton, delivered in cars alongside and duty—1.30 francs (25 cents)—paid by the sellers. These people could have paid 17 francs ($3.28) for American menu under the same conditions.

Should our exporters wish to sell coal with 70 per cent. large, they may be governed in price by the current value of best Cardiff.

The following conditions will usually fulfill the requirement of any French railway contract:

Water	1 per cent.
Volatile matter:	
Minimum	18 "
Maximum	24 "
Ash	9 "
Caloric force (minimum)	8,000 calories.

As to consistency, the coal should contain on delivery at destination not more than 30 per cent. menu, it being understood that all that passes through a sieve with holes 25 millimeters (0.98 inch) in diameter is menu.

Cardiff coal fulfilling the above conditions has recently been sold here, duty paid by the sellers, delivered on cars alongside, for 21.40 francs ($4.13) the ton of 2,205 pounds.

The uses of bituminous coal in France should also serve as a guide to the American exporter. For domestic purposes, the coal should not be too friable, as the necessary handling produces much dust and consequent loss; neither should it be too bituminous, on account of the smell and smoke.

For the manufacture of gas, the requirements are practically the same as in the United States, except, perhaps, that more stress is laid on the necessity for a large amount of coke. Large quantities of coal are consumed in factories in this part of France. Two important consumers say that under existing conditions American coal is worth about 10 per cent. less than the best Cardiff. How far this deficiency in value may be due to grates adapted to burning a coal with a greater per cent. of carbon and of a slower combustion than the American coal tried here, is a question which it may pay our exporters to investigate.

A High Potential Direct Current Plant for Experimental Work.

By Mr. G. S. Moler.

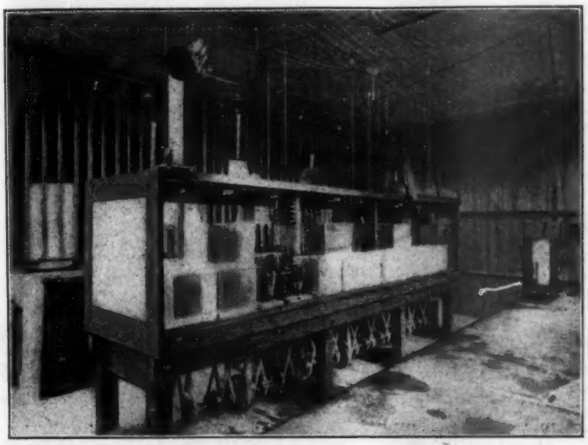
In order to have a direct current potential of about 12,000 volts available for experimental purposes it was decided by Dr. E. L. Nichols, professor of physics, and Harris J. Ryan, professor of electrical engineering in Sibley College, of Cornell University, that they would purchase jointly a large number of small high potential, direct current dynamos, and after thoroughly insulating them from each other, connect them like battery cells in series so as to obtain a potential equal to their added pressures. Such a set of dynamos was obtained and have been mounted in a suitable manner by the writer, making a high potential plant which has proved satisfactory in its workings.

In this plant 24 direct current separately excited dynamos of 500 volts each have their armatures connected in series so that a pressure between the terminals of the series is given which is equal to the sum of the individual pressures of the dynamos, this sum being from 12,000 to 14,000 volts, depending upon the speed and the degree of excitation. The full load current for which they were constructed is .22 of an ampere. For excitation purposes they are divided into three groups of eight each, which have their fields connected in series and to these the terminals of a 170-volt exciter is connected.

Three similar exciters with controlling rheostats are used. The dynamos and exciters were constructed by the Crocker-Wheeler Company, of Ampere, N. J., especially for this use, great care being taken in highly insulating them so that they would not break down under the enormous strains to which they might be subjected. It was assumed that the terminal pressure of 4,000 volts in a group of eight would not be sufficient to cause a leap from one terminal brush to the frame, then to the field wire, and from that again to the frame of the eighth and to its brush, thus short circuiting the group through their fields and through the exciter. To further insulate their frames from each other

they were placed upon individual slabs of polished dark Tennessee marble, and the wires from the brushes and those from the fields were carried down through glass tubes placed in holes drilled through the marble. The dynamos and exciters are all driven from the same countershaft by means of leather belting. It was thought that the leather would afford ample insulation between the frames of the machines, so no additional precautions were taken to insulate them from the countershaft. A massive table or framework of white pine was constructed and was stained, then it was coated with hot linseed oil, which was allowed to dry for several days, after which it was thoroughly varnished with shellac.

The table was constructed so that the dynamos could be mounted in two rows upon it. In each row they are placed one to each foot in length of the table, and in one row they are set a little ahead of those in the other row, so that their belts will not interfere upon the countershaft, which is placed between the legs of the table and near the floor. The exciters are placed upon raised platforms between the rows, as can be seen in the view. The rheostats shown near the exciters have



High Potential Direct Current Plant.

grooved wheels and are operated by means of cords extending to one side of the room. The top of the table is not solid, but consists of four longitudinal planks placed edgewise, supporting the ends of the two rows of small marble slabs. The slabs are about seven inches wide, thus leaving about 5-inch spaces down through which the belts are carried. The counter shaft is belted to an electric motor.

Over each machine is placed a galvanized wire netting cage and this is connected to the upper brush to keep it of the same potential as that brush; the adjacent cages, therefore, have a difference of potential of 500 volts. These are to protect the dynamos from any induced discharges which may take place among them. In the view two of the cages have been removed. A glass case with doors hinged at the top incloses the whole of the upper part of the table. The wires from the terminal dynamos are carried through porcelain tubes up through the top of this case, one of them to the circuit breaker, and each to an oil break switch.

The circuit breaker shown on the left hand end of the case has a long arm hinged at the top; this is actuated by means of a spring, so that when it is released from the catch at the bottom it flies upward, thus making an 18-inch gap in the circuit. The flash takes place between two pieces of carbon. The arm is latched again by revolving the wheel shown at the top of the circuit breaker, the wheel also opens the oil break switch before it latches the arm of the circuit breaker. The core of the solenoid of the circuit breaker has been adjusted to jump up with .24 of an ampere. The oil break switch consists of a plunger immersed in oil but held up by means of a spring unless it is pushed down against the contact plate in the bottom of the oil reservoir by an arm extending outward from the wheel of the circuit breaker. When opening the oil break, the plunger follows the arm to the limit of its path then the arm leaves it, making an 18-inch gap in the circuit. In this way the wide gap is made without swinging through space an arm which is dripping with oil.

At the farther end of the case the second oil break switch is located; it is also operated by means of a wheel, and these wheels are both turned by means of cords extending to the side of the room. A cord to open the circuit of the driving electric motor extends to the same place. These cords are all for the purpose of enabling the operator to make the proper adjustments without exposing himself to the high potential current.

The wires from the oil break switches are carried to insulators, which consist of long porcelain tubes suspended from the ceiling of the room; screwed into plugs in the lower ends of these tubes are screw eyes, through which the wire is carried.

In the preliminary test of the apparatus each little dynamo was run alone, and its brushes were connected to two 250-volt incandescent lamps which were joined in series, and at the same time the exciter was connected to the 8 field circuits of that group to which the little dynamo belonged. In this way the brushes were adjusted before the cages were placed over the machines.

After these adjustments were made, the individual groups were tried to note the effect of changing the rheostats of the exciters. A Kelvin electrostatic voltmeter having a range of 20,000 volts was used to denote the pressures obtained.

The circuit breaker was found to work promptly under all conditions of overload, the severest test being suddenly to short circuit the terminals at the voltmeter. In this case a thick flame, 9 or 10 inches long, would be drawn out by the moving parts as the gap was being widened. A rough test of the jumping distance of the current at 12,000 volts was made by bringing the blunt ends of two No. 14 B. & S. gauge copper wires near to each other, these wires being connected to the leads near the electrostatic voltmeter. When the space was reduced to about 16 mm. an arc was suddenly formed, which lasted till the circuit was opened by the circuit breaker. With 14,000 volts the space was about a millimeter longer.

The plant was run in the dark to observe the brush discharge that might take place around the small dynamos or from any part of the circuit and connections. A feeble glow could be detected at the ends of the leads, especially when they were almost near enough for the current to leap across; also a glow was detected around some of the connections, but around the brushes and the dynamos themselves none could be seen, for the reason that the sparking commutators gave considerable light.

Each little dynamo appears to operate just the same as if it were entirely alone, so it would seem that another similar set might be connected in series to the present one with a considerable degree of confidence that they would operate successfully together.

Acetylene Mine Lamps: Some Comparisons.

A recent issue of the Philadelphia *Times* contained two interesting articles pertaining to mining. One of these handled the current labor difficulty between the anthracite coal miners and the operators, the other took up the subject of mine lamps.

In treating the latter question, our contemporary says that acetylene, having made great headway in recent years, now seems likely to come into use in the new field of lighting mine workings.

Oil, says the same article, has many advantages; it is cheap, is easily obtainable, and the men are accustomed to its use. It has, however, two serious drawbacks. The smoke which arises is often so great as to drive men out of small workings, many mines requiring extra ventilation on that account. In gold and silver mines it cannot be used successfully, because spilled oil interferes with the separation of the metal. Where a good grade of oil is used the cost of each miner's lamp, including wicks, is about 5 cents per lamp for 8 hours' use. Pure kerosene makes it somewhat less, but gives more smoke.

Paraffine candles have been generally adopted in the West, in the large mines of precious metals, and the miners have become so accustomed to their use that this is practically the only means of subterranean illumination used in these mines. Candles, however, are expensive, to start with, and then so much of the wax is lost by guttering that only a part is used in illuminating. However, they partially overcome the difficulty of smoke and are much less liable to set a mine on fire, and, therefore, have proved a little more satisfactory than oil. The cost of lighting by candles greatly exceeds that of oil. Figures obtained from a silver mine in New Mexico, employing 350 men, show that the cost for candles is $3 per month per man, working 30 days per month, or 10 cents per day per man.

The acetylene devices shown in the accompanying cut are a "superintendent's lamp" and a "gang lamp," the latter being on the right. The former is intended for superintendents, surveyors, mine bosses, inspectors and others moving from place to place. It is a very compact form, provided with a swivel hook bail, which can be hooked in the clothes or turned and used as a handle. Two swinging holding candles are also provided for cases where it is desirable to use the lamp like a bullseye. Just under the center of the burning jet is a metal point which permits the flame to be placed directly over a surveying point. As the flame

Acetylene Mining Lamps.

when looked at end on is about ¼ inch in diameter, a very close setting of a transit is possible. This lamp weighs 9 ounces and burns at full brilliancy 4 hours, costing not over 2 cents for this period.

The larger form, or "gang lamp," is intended for headings, enlargements, stations and switching points, where a large volume of light must be had to permit several men to work. The No. 8 lamp, burning ¼ foot per hour, gives about 20-candle power. When placed in the dark, 6 inches away from a 16-candle power electric light and looked at from a distance, it is said to make the electric light appear only a red wire.

Taking the average sized room, which would be well lighted by an illumination equal to 64 standard candles, we find that this amount of light from the various illuminants would have the following effect on the atmosphere:

Illuminant.	Oxygen Removed from Air. Cubic Feet.	Products. Water Vapor. Cubic Feet.	Products. Carbon Dioxide. Cubic Feet.
Sperm candles	38.5	26.2	43.6
Kerosene	24.9	14.0	39.8
London gas batswing	26.1	28.4	19.2
Acetylene	5.0	2.0	4.0

To afford a further comparison we select a mine, working 365 days in the year, and consider it using lamps burning ½ pound carbide per day:

First Year.

Candles for 350 men, at $3 per month per man, for one year, cost		$12,600,000
365 No. 7 lamps, at $4.50, cost	$1,575.00	
175 pounds of carbide per day for 1 year, cost.	3,832.50	5,407.50
Saved by using acetylene lamps		$7,192.50

Second Year.

Candles for 350 men, at $3 per month per man, for one year, cost		$12 600.00
175 pounds of carbide per day for 1 year, cost.	$3,832.50	
Repairs, say, 50 cents per lamp	175.00	$4,007.50
Saved second year by using acetylene lamps		$8,592.50

But the saving is actually far greater, for 2, 3, and even 4 men, often work by the light of one lamp, using candles or oil only on entering and leaving the mine, so that not nearly so many lamps are required or so much carbide as in the above article.

The Duties of Engineers in Enforcing Contracts.

By Mr. Albert J. Himes, in *Engineering News.*

In the last half dozen years the conduct of engineers in the enforcement of contracts for public works has been a frequent matter for public criticism. Moreover, so many conflicting opinions have appeared concerning it from engineers themselves that the professional mind appears to be quite hazy on this very important matter. A thorough discussion of the subject may clear up many doubts and misconceptions and make life happier for those charged with important trusts who are a little lacking in experience. The writer has felt the need of a safe criterion in such matters, and in submitting what follows he hopes to profit from the remarks of others whose experience has been wider than his own.

In the first place, it is noticeable that the engineer is seldon made the executive head of a great undertaking. His position is rather that of an expert counselor on subjects within his sphere. In early life he is a surveyor or skilled workman, his authority exists because of certain powers to calculate and plan which untrained men cannot readily acquire, but in matters of inspection he is set aside as being too young or impractical. A very prominent engineer once remarked that "the engineer could not control the quality of construction, that one must depend on the inspectors." That was a very practical statement, as it expressed a general condition, but it does not prove that the condition is a necessary one.

What can be more unjust and discouraging than that an engineer should be censured for the failure af his plans when the real cause of the failure is their improper execution by parties not responsible to the engineer.

It is told of the late Professor Gillespies that he was asked by Horace Greeley to design a dam of a certain height. He did so and the matter was forgotten. Some time later there appeared in Greely's paper a fierce denunciation of the engineering profession, and Professor Gillespie, on inquiry, learned that Greeley had built a dam on his estate and the dam had failed. A more thorough investigation showed that after building the dam according to the plan, a considerable addition was made to its height, but the section remained unchanged. Failure was inevitable.

The present day editor would be no more considerate if through the inefficiency of inspectors appointed by some Board of Public Works a dam should fail which had been correctly designed but improperly drained and cemented.

It is now becoming generally recognized, not only by engineers but by well informed business men, that any large piece of construction is best performed by a competent engineer acting as the executive head of the undertaking. Such a man is, of course, dependent on inspectors, but they are of his own choosing and so are his engineering assistants.

When the nature of the work requires the use of skilled labor, a good mechanic is often the best available inspector, but the writer's experience would indicate that with necessary preliminary training an engineering graduate makes the best inspector obtainable, and that the more general employment of such men would make an improvement in the quality of engineering work.

To insure good work it is necessary for the inspector to feel that he has the active sympathy and good will of his employer. There are many critical occasions in the progress of a work where it is difficult to verify statements made by either the foreman or the inspector, and if there is a tendency to ignore or overrule the inspector he is not likely to incur the ill will of the workmen and the rebuke of his employer by insisting that work shall be done right when the errors are quickly hidden and may never be known. The proper way is for the employer to visit his inspectors frequently, to be familiar with their work and give them necessary instructions without waiting for an appeal from the contractor. Such an appeal is generally the result of long standing tension between the inspectors and foremen, and if the inspector is overruled, he might as well be relieved. His usefulness on that work, if not wholly gone, is greatly lessened.

There is a tendency among engineers who have a limited experience in construction to be superficial in their inspection. To use their language:

It is inadmissible to pry into the contractor's affairs or exhibit suspicion of his work; such treatment will drive any man to crime.

But the engineer who takes such a view of this matter writes himself down as unfitted to take responsible charge of work. Such a man would not ask for competitive bids for merchandise as required in government affairs, as such a course would imply a suspicion that the first merchant consulted was unfair; he would not ask for a receipt for money paid, as it would imply a suspicion that the payee would later deny the payment. In short, such a man has too sensitive a nature to do business. He ought to play golf.

It is never dishonorable to ask a man to perform his contract, and no reputable contractor will refuse to do so if it is insisted upon. The production of bills of material and receipts for payments of claims that may become liens on the work are ordinary safeguards, and in no sense a persecution or an insult.

In matters of business a man knows only what he sees, and for an engineer to say he knows a certain thing has been done because the contractor said he did it is conclusive evidence of a weak nature.

It is no injustice to contractors to say that they need watching. In fact, some men like to be watched, and like to know that the inspector understands what he sees. Efficient inspection allays suspicion, and in case of unforeseen difficulties it is much easier for a contractor to get assistance if some one knows that his work has been well done. On

the other hand, an officious and incompetent inspector is the bane of a contractor's life.

Specifications are frequently written by some one more or less unfamiliar with the practical methods of doing work, or worse than that, they are inherited and are out of date. In such cases interpretation is necessary, and permission should be given in the contract for such interpretation.

The idea of reducing the working parts of a large corporation to a standard is a good one, and should result in economy, but when the standardization is dependent upon an inflexible order that no departures be made, much confusion and loss will follow.

In the interpretation of contracts a wide experience in general business, as well as construction, and a full knowledge of existing conditions are necessary for success. Perfection does not exist, and it is even rare that men are willing to strive for it. Business men, experienced and successful in one particular line, are prone to look with contempt upon the efforts of an engineer to secure perfect work. Their expenses for handling storage, breakage, rent, help and the like are so variable that large margins are necessary. Thirty, 50, and even 100 per cent. increase in selling price over purchase price are not uncommon, and judging by their own affairs they doubt the wisdom of insisting on the least particular of a contract.

Again, there has been so much competition in engineering work, and the profits have been so small, that the enforcement of minor requirements has seemed like nagging.

The subject is not purely an engineering matter, but largely one of business and human nature. The primary aim of each party to a contract is to get all he can out of it and their methods are governed by expediency. Where the amount involved is small and a continuance of business relations is desired—as in the case of retail trade—the satisfaction of the purchaser is of prime importance. When a railroad has a large amount of work to do, a contractor is interested to give satisfaction in order that he may receive more work. If the company is doing a legitimate business, it is likewise interested to have the contractor, if he is a good one, make enough profit to keep him interested in the work. Where the contract is large and the parties thereto will have no further business relations, the aim of each is to get all he can and still effect a settlement without a suit. That is the contractor's position in a public works contract.

Such are the conflicting interests of the principal parties, and the engineer holds a very peculiar position. He is in the employ of one of the parties, but must nevertheless be an impartial arbiter between the two.

There seems to be some confusion of ideas as to the rights and duties for engineers in private and public works, respectively.

In private business the specifications of an engineer are looked upon as merely one of his tools. They are seldom understood or appreciated, or even examined by the parties who pay for the work. The final judgment is passed upon the results, regardless of the manner of achievement. The authority of the parties furnishing the money is final, and their satisfaction is the engineer's success.

Not so in public affairs. The final judgment is then passed by the people, and it is not enough that the best posted or even that the majority should be satisfied. Any departure from the strict letter of the contract is treated as an infringement of the rights of the minority and will be punished.

Unsuccessful bidders, their friends, politicians and adventurers will make capital out of any departure from the straight and narrow path. Such a departure is ammunition, and it will be used. The weight of a name and a reputation cannot curb the yellow journals nor muzzle the malcontents.

Men who are foremost to condemn an official for improper conduct will often be first to try to influence his acts by improper means. The law condemns the acceptance by an agent of fees from both parties to a transaction if the facts are unsanctioned by the principals. Yet all kinds of valuable presents, discounts, etc., are offered by reputable business men to cultivate the goodwill and patronage of public men.

It is, therefore, wise that every government contract should be drawn with great care to avoid the chance for disputes over its interpretation.

A contract must be complete and definite in all its terms, and a contract to do impossibilities is void. Material modifications of a contract may amount to an abrogation thereof. Large contracting firms employ lawyers, and are better posted than engineers upon the fine points of contract law. They often seek to do extra work or to change the plans, or in some way to get away from the original contract that they may have a claim for adjustment, a claim whose accuracy no one can prove, and which could not exist if the original contract were properly drawn and enforced, but a claim which is often settled at large cost to avoid prolonged disputes.

It is doubtful if any authority can be legally exercised to vary the terms of a contract entered into as a result of competitive bidding in pursuance of an enactment of law.

Boiler Bracing.—No. II.

By W. H. Wakeman, in *Electricity*.

Having found the area on which steam pressure acts, it must be multiplied by the pressure per square inch, in order to determine the total load to be carried. Assuming it to be 100 pounds, the total is $937 \times 100 = 93{,}700$ pounds.

The next step is to find the number of braces required for this load, assuming that each one is made of round iron 1¼ inches in diameter, as this is the size usually employed for this purpose. One very good reason for using this size is that when they are applied to a boiler, which is designed so that the braces are not overloaded, they will be near enough to support the plate properly, and prevent it from springing between the braces or stays.

A very safe and conservative rule has been adopted by the U. S. Government Inspectors, which limits the load on small braces to 6,000 pounds per square inch of sectional area.

Now the area of a circle 1¼ inches in diameter is practically 1 square inch, therefore the safe load for one of these braces is 6,000 pounds. As the total load is 93,700 pounds, we find that $93{,}700 \div 6{,}000 = 15.6$ braces are required, which means 16, as no fractions can be allowed.

If 937 square inches are supported by 16 braces, then each brace holds $937 \div 16 = 58$ square inches, or a space about 7.5 inches square, and the head is strong enough to prevent springing between these braces when so located.

A few days ago I examined an old boiler that had been brought to a boiler shop for extensive repairs.

The heads above the tubes were supported by braces which extended from head to head, although the boiler was a few feet longer than many of its type that are now made. It appeared quite different from those in which braces are anchored to the shell according to the prevailing custom.

Although the plan of bracing a boiler above the tubes, with braces extending from head to head, is now nearly or quite obsolete, there are some things to be said in its favor. Between the heads of an ordinary tubular boiler, there are several weak places, caused by seams which join the plates together, and by cutting holes for steam nozzles, a dome, and for a place by which to enter the boiler. Through braces span all of these and tie the heads together without bringing any more load on them than the area on one head multiplied by the pressure per square inch accounts for, and this must be held by braces that extend from a head to the first or second sheet.

A careful consideration of both plans in detail shows that the through brace sustains less load than the brace from head to shell, because the latter is on an angle and this increases the load according to the angle at which the brace holds.

For illustration, suppose that a through brace carries a load of 6,000 pounds. This stands parallel to the axis of the shell, but when a brace runs from head to shell it stands at an angle to this axis. The rule for determining the load of such a brace instructs us to divide the load that would be on it, if it was parallel to the axis, by the cosine of the angle at which it really stands.

If it stands at an angle of 30°, the cosine is .866, therefore the actual load is $6{,}000 \div .866 = 6{,}928$ pounds.

This makes an important addition to the load on a through brace, and as it is seldom mentioned in articles on this subject, a reason for this omission will be given. In the case just taken for illustration, each brace supports 58 square inches, and the excess is 928 pounds; therefore, the excess of pressure per square inch is $928 \div 58 = 16$ pounds. If there were no braces above the tubes, the head would carry this pressure without bulging, therefore it may be omitted when calculating the braces necessary, because the excess of load due to braces at an angle compensates for it; or, in other words, the excess of one balances the deficiency in the other, and omitting both greatly simplifies the calculation. Engineers have claimed that when a brace extends from one head to the other, it carries a greater load than when it extends from head to shell, because it holds two heads instead of one; but this is evidently an error, for it makes no difference, when one end of a brace is fastened to a boiler head, how the other end is held or what holds it, so long as the angle is not changed.

The head of a tubular, flue or a plain cylinder boiler may be strengthened by riveting on angle irons or other plates to which braces are anchored, but when stay bolts are put in the water leg of a locomotive boiler, there is no chance to do this for obvious reasons, therefore the plate must be entirely self-supporting between the stay bolts. This means that with a plate of given thickness, to carry a stated pressure, the stay bolts must be near enough together to prevent the plate from springing.

Now the pressure per square inch on the water leg of a locomotive boiler, is not more than 3 or 4 pounds per square inch in excess of that on the head of a tubular boiler above the tubes, when the steam gauge indicates the same in both cases. This depends upon the vertical distance from the stay bolt to the water line, as the pressure increases 1 pound for each 30 inches of hot water. Ordinary calculations do not take this into account.

It is customary, however, to put stay bolts nearer together than braces, because they are much more liable to be weakened by corrosion, and, of course, the plate at this point is exposed to the same danger; but if the pitch is not greater than can be allowed for a bolt .75 inch in diameter, it will not be too great for a plate .375 inch thick. If given the same pitch in a heavier plate, a stronger boiler is secured.

The area of such a bolt is .44 square inch, and allowing a stress of 6,000 pounds per square inch of sectional area, shows that it will safely carry 2,640 pounds. For a steam pressure of 100 pounds per square inch this will admit of 26 square inches exposed to pressure. The square root of 26 is practically 5, which is the pitch of stay bolts according to this calculation, and it agrees well with common practice along this line.

With larger bolts and thicker plates the pitch may be increased to twice 5 inches, but the above is a safe rule for stationary boilers, and safety is the most important consideration.

The water leg of a vertical boiler presents a different problem if it is desired to take into consideration all points, as the outer shell is subjected to a bursting, and the inner to a collapsing pressure. The whole matter is brought down to a very simple basis, however, when we find that it is perfectly safe to apply the same rule that is used for flat surfaces, taking the pitch on the inside of the leg.

This gives a greater pitch to the outside, but it is warranted, because the plate is bent into the form of a circle, which is the strongest shape that it can be put into when pressure acts on the inside of it, and this curve compensates for the greater pitch.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, July 10th, 1902.

The Gas Institute Meeting.—Illuminations for the Coronation.

The special feature of last month was the meeting of the Gas Institute at Southampton under the guidance of the President, Mr. S.W. Durkin, which was a success both from a business and from a social point of view. Mr. Durkin has just celebrated the jubilee of his service with the Southampton Gas Company, and in alluding to this fact in his address said that he was approaching the time of the sere and yellow leaf; but there was not the slightest indication of the decrepitude of old age in the smart, business-like way in which things were kept going from beginning to end, and every item of a very heavy programme was competently tackled and dealt with. A great deal of the success of the meeting was due to the fact that the President is highly respected in his native town, as evidenced by the manner in which the Mayor, the Chairman and Directors of the Gas Company and other officials entered into the spirit of the proceedings. The principal items on the agenda were a lecture on electric traction and electrolysis, by Mr. James Swinbourne, a paper by Mr. Dugald Clerk, on large gas engines and the gases used by them, which was practically a full-blown lecture illustrated with lime light photographs; papers on the maintenance of gas burners and on the fittings business as an aid to the sale of gas; a description of the steam turbine as a motor for blowing and exhausting apparatus, by Mr. W. D. Child; some special examples and practice in gas distribution, by Mr. Walter Hole; a discourse on the capital of gas undertakings, by Mr. C. E. Jones; a description of a new kind of meter, by Mr. T. G. Marsh; and of an automatic lighting and extinguishing apparatus for street lamps, by Mr. W. R. Mealing; the valuation of gas oils, by Mr. J. P. Leather; and last, but not least, a very elaborate and carefully prepared paper on "Sunday Rest for Gas Workers," by R. G. Shadbolt. The steam turbine, the new make of meter, and the automatic street lamp apparatus are all extremely interesting and novel mechanical appliances. It should be one of the duties, not of the Gas Institute, but of the proprietors of gas works, to encourage invention. Considering the magnitude of the industry, the number of mechanical inventions introduced in connection with it is extremely rare, and the reason is that the inventor is expected to be a public benefactor instead of receiving a fair reward for his work. The idea may be impracticable, but I cannot help thinking that if the originator of any really meritorious invention could feel assured of a fair reward for his labor, we should hear more frequently of novelties in this direction. The man with an established name and connection may be able to get a profit from a good invention, because any first-class firm will be glad to take it up on royalty. But there is very little inducement for a nobody to invent, and, indeed, the practical, hard-headed friends of a man who develops proclivities in this direction become as anxious about him as if he had developed a taste for horse racing or other extravagant amusement. All this, however, by the way. The steam turbine promises great improvement on the usual horizontal engine belting and intermediate shaft, which constitutes the usual paraphernalia for running a blower or an exhauster, as the whole is self-contained on one box plate and does not require anchor boltage. Mr. Marsh substitutes for the drum of a station meter a simple set of rotary vanes of the anemometer type, greatly reducing the size and the cost of the apparatus. If not calculated to satisfy the requirements of the official examiner, the apparatus appears sufficiently accurate for use in connection with either a coal or a water gas plant, or for measuring large quantities of cheap gas. The automatic street lamp apparatus has been the subject of laborious experiment for many years. It simply substitutes for the labor of visiting each lamp twice a day a weekly visit to wind up the clock and set the pointers to the hour and minute of turning on and turning off. A modification is made for use with large lights that require to be reduced at midnight. The obvious advantage of the apparatus is that it saves 10 per cent. or more of gas. Assuming that the lamplighters have an hour's run, they must start both rounds an hour or nearly so before the nominal hour of lighting and finish an hour after the nominal time of extinguishing. With an apparatus that lights up or extinguishes at the time to which it is set there is an average saving of 1 to 1½ hours per diem. The discussion on maintenance and fittings was very animated and should satisfy those who believe in the importance of the commercial end of the business, that even if there has been some slackness in this department in the past, it is now very much in the minds of gas managers.

One item that must not be passed over was the carrying, without dissent, of two resolutions which practically clear the way for an amalgamation with the Institution of Gas Engineers and the merging of the two into one body. It will be remembered that, on account of differences which need not now be raked up, a somewhat important swarm of members forsook the old hive, some 10 years ago, and set up an independent Institufion, and that ever since that time there has been a second body claiming to represent to some extent, at any rate, the gas engineers of the United Kingdom. The inconveniences and disadvantages of such divisions to all concerned, speedily became evident, and several previous Presidents have worked hard in preparing the ground for the work that is now in a fair way to be consummated. Possibly the amalgamated Institute will secure a more extended recognition from the proprietors of gas works than has been available in the past, and thus be enabled to make some substantial advancement in the work that is being done on behalf of the Industry. There is plenty to do. Education, research, statistical and other information, are all fields deserving ample cultivation. The commercial department can be assisted in many ways by combined or general effort. And while not forgetting the young, the interest of the established practitioners should not be overlooked, and especially the needs of those who are incapacitated by old age or ill health. At present the benevolent fund distributes a trifle, about 5s. a day, and it is scarcely creditable that this small sum adequately represents the needs of the unfortunate members of the profession. Let us hope that the amalgamation will inaugurate a more active and vigorous existence in every department.

The postponement of the Coronation has in many respects created an unsettled state of affairs. Preparation had been made for a national rejoicing on an unprecedented scale. In our own particular line all the leading houses had vied with each other in bringing out new and original designs, and gas illuminations have been very much before our minds during the last 6 months. In this matter electricity has occupied the same position as it does in regard to ordinary business. While possessing certain special advantages it is much more costly and not so effective as gas. The movement of the gas flames with each breath of air gives a lively effect, both as regards naked, or crystal devices, that cannot be obtained by other means and will always secure

a certain patronage for gas, irrespective of other considerations. The demand for gas devices has been greater than on any previous occasion, but unfortunately there has been the usual tendency to trot out the old stagers, the Brunswick Stars, the Union Jacks, the Crowns, etc., that have done duty for the last 50 years, rather than to place an order for something of a striking and novel character. So far as it is possible to judge, seeing that there has not yet been anything like a general illumination (though we hope there will be one in August) the public have not taken full advantage of the hundreds of novelties in the way of gas illuminations that have been put upon the market. Many of these are cheap and at the same time effective, and in a general way there has been a commendable tendency towards enterprise in the matter of price, so that anyone who was prepared to spend a reasonable sum could make a good show for his money. But illuminations are not in everyday demand, and therefore as above observed, there is a tendency towards hiring any old device that may be in stock, in preference to ordering something new. To give one example I may describe the "Edward VII. Star." This consisted of 7 arms radiating from a central boss, each arm carrying 7 iron jets, and each jet comprising 7 holes or perforations. The wholesale price of this device was 12s. 6d. Double blocked letters such as E. R. were to be had at 12s. to 15s., and stars, crowns, etc., were offered at a considerable reduction in price as compared with previous occasions. The result was that the early part of the week ended the 28th ult., found most gas engineers expecting some extra consumption at the end of the week. And then on the Tuesday came the news that the illuminations would not be wanted. The effect in a general way was disastrous. But no very serious inconvenience was caused to gas companies. The illuminations would not be required till 9 P. M. at this time of the year, and would be extinguished at midnight, and the quantity consumed would not have compensated for the closing of shops and places of business. Some writers in the daily press have endeavored to portray the effects of the postponement upon the revenues of gas companies, with the usual amusing results. One gentleman went and looked over the wall of the gasholder yard on the Friday morning, and discovered that the gasholders were full. He appears to have thought that the gas company had expected and hoped to have them empty at that time. Another scribe opined that the wheels of the meters did not revolve so fast as was expected, being evidently ignorant of the fact that the gas for illuminations does not pass through a meter. In many neighborhoods the receipt of more cheering news than that of the memorable Tuesday, which created as much popular excitement as a declaration of war, was made the excuse for a partial carrying out of some of the items that had been arranged for the 26th and 27th ult. The welcome announcement that the King was out of danger was an excuse for bonfires and fireworks, for processions, public dinners, and teas. Altogether it seems that the public will let off all their spare steam before the actual consummation of the coronation. And all who are concerned in responsibilities such as that of maintaining gas supply will feel greatly relieved when the event is over. Public offices, banks and places of business that can absolutely close down from Saturday afternoon till Monday morning suffer no inconvenience from having two holidays instead of one, but it is different with gas men.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

WE are indebted to a correspondent in Los Angeles, Cal., for the following: "The sale of the property and franchises of the Pomona (Cal.) Gas and Electric Light Company has been completed. The purchaser is Mr. Herbert Cutler Brown, and the negotiations respecting the sale have been underway for a long time. Mr. Brown has been concerned in quite a number of transactions in gas properties in Southern California. The Pomona Company in its present state was organized in 1893, when the stockholders of the old San Antonio Light and Power Company got a controlling interest in the plant. Mr. J. Albert Dole has been President since the combination was effected. The other officers are: Vice-President, George F. Ferris; Secretary, Arthur M. Dole; Manager, I. C. Carter. The Company is capitalized in $50,000. Undoubtedly when the new purchasers have surveyed the situation, important plant betterments and main extensions will be arranged for."

THE proprietors of the Muncie (Ind.) Heat, Light and Power Company have notified the residents that, after September 30th, the Company will discontinue the furnishing of gas for heating purposes.

THE Alton (Ills) Railway, Gas and Electric Company is extending its mains through the streets of the outlying village of North Alton.

THE following self-explanatory circular was issued the 19th inst., by Mr. Charles D. Robison, Treasurer and Superintendent of the Auburn (N. Y.) Gas Company:

"To our Consumers: In view of the competition between this Company and the Citizens Light, Heat and Power Company, as soon as the Citizens Company begins to deliver gas the Auburn Gas Company will sell gas for all purposes at the rate of 85 cents per 1,000 cubic feet, less 10 cents per 1,000 if paid before the 10th of month. This makes a net price of 75 cents per 1,000 cubic feet, and will be in effect in all districts covered by mains of the opposition Company. We wish to again assure our customers that we mean to keep our rates at a point where it will be no object for anybody to change to the new Company. Prices will go to a place where they mean ruin for one Company or the other, but we trust to be able to survive, and realize that the only way out will be to beat the new Company at every point—in price, quality of service and attention to wants of customers. We would like to say that our price is lower than in any other city of its size in the State. Utica, Binghamton, Elmira and Troy all have higher rates, but in this coming gas war the question will not be at what price we can afford to sell gas but how cheaply the other Company is selling. We hope to hold your business."

THE Essex and Hudson Gas Company, of Newark, N. J., is proposing to extend its mains through the borough of Springfield.

AT the annual meeting of the shareholders in the Ogden Gas Company, of Chicago, the following officers were elected: Directors, Jno. R. Walsh, Jno. M. Smyth, Jno. A. Spoor, Thos. Gahan and Roger C. Sullivan; President, Thomas Gahan; Treasurer and Secretary, R. C. Sullivan.

COL. ROBERT GRIER MONROE has been appointed Commissioner of Water Supply, Gas and Electricity for New York city, vice Mr. J. H. Dougherty, resigned.

THE properties of the St. Cloud (Minn.) Gas and Electric Company have been transferred to the Public Service Company. Mr. A. G. Whitney is to have the management of the plants.

A CORRESPONDENT forwards the following from Harrisburg, Pa.: "The first judicial construction of the act of May 29, 1901, supplemental to the general corporation act of 1874, providing for the merger of corporations was contained in an opinion handed down some days ago by the Dauphin County Court, declaring that electric light and gas companies, chartered under the act of 1874, may consolidate. The decision is important and far reaching in its effects. The decision was given in the case of a bill filed by the Commonwealth, at the instance of the Attorney-General, to enjoin the Huntingdon Gas Company and the Huntingdon Electric Light Company from consolidating. The right to consolidate, it was claimed on behalf of the Companies, was conferred by the acts of April 17, 1876, and May 29, 1901, supplemental to the general corporation act of 1874, but the Commonwealth urged, amongst other objections, that these acts do not authorize the consolidation of companies organized for different purposes. While technically supplying gas and supplying electricity to the public are different purposes, yet the court finds that both companies are engaged in the business of supplying light, and that, in any case, the language of the acts of assembly is so broad and general as to leave no doubt as to the authority conferred to merge and consolidate. After referring with approval to the rule of the State department, under which a charter will be issued for only a single purpose, the court says: 'When, however, corporations are once in being, and the legislature has in plain language authorized a merger of rights and property by companies created under a designated act, and such merger and consolidation are not affected by constitutional limitation, there is nothing left for a court but to declare that corporations, circumstanced as the defendants are, may lawfully merge and consolidate.'"

ACCORDING to a recent issue of the Boston *Advertiser* preparations are now apparently being made for the abandonment of the old plant of the Boston Gas Company at the North End, although no definite statement has been obtainable, and doubtless within a few months it will be devoted to other uses. Whether the Company will put it in the market or not is uncertain, but every indication points to such action on its part. Work at this plant was stopped some time ago, and since then there has been under way a general clearing up and removal of machinery to the Commercial Point property of the Company in Dorchester. The waterfront property of the Company is one of the most valuable in the city.

There is a frontage on the stream of between 600 and 800 feet, all of it facing upon an excellent channel, that used by the large steamships of the Dominion and other lines whose docks are just across the Charles on the Charlestown side. On the water front the Gas Company has 2,500 square feet of dock, 150,071 square feet of solid and 30,708 square feet of pile wharf, the whole, with the land adjoining, assessed at $422,800. The buildings by the last rating on the books are valued at $59,900, and the machinery at $40,000. In addition to the water front property the Company has 236,405 feet of land in Prince, Commercial, Hull and Snow Hill streets, and 14,635 feet of land at the corner of Commercial and Hull streets, where the only remaining gasholder sits. The total valuation of all the land held by the Company at the North End is put at $732,000. On the land at the south side of Commercial street there are buildings valued at $207,500, and machinery assessed at $503,000, making the assessment of the whole plant at $1,500,000, half of which is on the land. The Commercial Point property of the Company includes 1,981,859 square feet, which is valued at $323,7000. With the buildings the whole plant is assessed at $1,062,00. As the Company is not manufacturing at either of its plants at present, but taking its gas from outside, it would seem quite logical for it to dispose of its valuable land at the North End, as it has plenty of land as well adapted for its purposes, should it choose to manufacture again, at Commercial Point."

THE Nescopeck Illuminating Gas Company, of Nescopeck, Luzerne county, Pa., is to manufacture and supply gas for light only to the borough of Nescopeck, Luzerne county, on the opposite side of the river from Berwick, Columbia county. The incorporators are Avery C. Sickels, E. A. Pinkney and Frank P. Snodgrass.

AT the annual meeting of the Municipal Gas Company, of Albany, N. Y., Mr. William J. Walker was chosen a Director in place of the late Mr. John G. Myers. The other officers elected were: Directors, Anthony N. Brady, Robt. C. Pruyn, John Bowe, William McEwan, H. G. Young and John A. Delahanty; President, Anthony N. Brady; Vice-President, Robt. C. Pruyn; Secretary and Treasurer, Henry Bronk. The regular quarterly dividend of 2½ per cent. was declared. It is payable August 1st.

AT the first annual meeting of the Cadillac (Mich.) Gas Company the officers elected were: President, W. J. Cornwell; Vice-President, E. F. Sawyer; Secretary, F. W. Freese; Treasurer, D. Quirk; Superintendent and General Manager, F. W. Freese. The Company expects to begin active operations by the 15th prox.

AT the annual meeting of the Lockport (N.Y.) Gas and Electric Company no change was made in the executive management. Superintendent Slade's annual reports showed a good round increase in the volume of business done, compared with the records of the preceding year.

THE West Seneca Light, Heat and Power Company, to supply gas and electricity to the towns of West Seneca, Hamburg and Cheekowaga, and the villages of Doyle, Depew, Sloan and Blesdell, N. Y., has been incorporated by Messrs. E. B. Smith, C. A. Hahl and H. N. Kraft. The concern is capitalized in $200,000.

THE Milwaukee Gas Light Company has awarded a contract for the coal handling machinery to be installed in its new plant in the Menominee Valley to the Brown Hoisting Machinery Company, of Cleveland.

THE Somerset Lighting Company, of New Jersey, is extending its main system to and through the streets of Bound Brook, from Somerville.

THE Directors of the Louisville (Ky.) Gas Company have perfected the following executive organization: President, Udolpho Snead; Vice-President, John Stites; Chief Engineer, A. H. Barret; Executive Committee, H. V. Loving, E. W. Smith and George Gaulbert. A semi-annual dividend of 2½ per cent. was declared.

MR. J. R. TODD has been given charge of the gas stove department of the Portsmouth (N. H.) Company.

A CORRESPONDENT forwards the following: "In the absence of any facts upon which to base an inference of duty," says an opinion handed down from the Appellate Division of the Supreme Court of Rhode Island, by Chief Justice Stiness, "A court cannot infer a general obligation to inspect (gas) pipes in a private house which are not under the control of the Company and as to which it has no apparent relation other than the fact that its gas is to be used through pipes placed therein by the owner as it has suited him to have them." This ruling is made in the negligence suit brought by Mary L. Smith against the Pawtucket Gas Company, the Company's demurrer to the declaration being sustained. The suit was for negligence in introducing gas into a house at the request of a tenant. It was alleged that a "dangerous machine," called a slot meter, was placed therein by the defendant, but it was not stated that the meter itself had any direct relation to the injury sustained, nor that it was defective in any way, or if so that the plaintiff had no means of knowledge of the defect whereby he was able to state in what the defect consisted. It is alleged in the declaration that the defendant did not inspect or test the gas pipes in the house, which had been long out of use, to make sure that they were in suitable condition to receive the gas, and in relation to this allegation the court holds as stated in the opening sentence. "The plaintiff argues," says the Chief Justice, "that negligence is to be inferred from the fact that the Company is dealing with a dangerous substance and hence bound to use great care in its introduction. Doubtless this is true so far as it relates to anything done by the Company. But one who applies for gas is equally presumed to have knowledge of the danger and the duty is upon him to see that his own pipes, through which the gas is to be used, are in good order. This duty is stronger and more direct upon him than upon the Company. * * * When an owner lets a house supplied with gas pipes permission to use the pipes is to be presumed and a consequent authority to apply for gas. The owner is, therefore, as much responsible for the condition of the pipes as though he had applied for it himself."

THE Orange County (N. Y.) Gas and Electric Light Company's properties have been purchased by the Henry Floy Company, of New York. At a meeting of the new shareholders the following officers were elected: President, Henry Floy; Vice-President, W. C. Kimball: Secretary, L. L. Lewis; Treasurer, C. Fitzgerald; Counsel, H. W. Wiggins. Mr. Fitzgerald, who was Treasurer and Manager of the old Company, will remain as Manager for the present. Mr. J. Max will be continued as Superintendent.

THE sum turned in to the public treasury of Des Moines, Ia., by the Capital City Gas Company, on account of the franchise stipulation that it shall pay to the city 2 per cent. of its gross receipts, for the half year ended June 30th, amounted to $2,268.48.

CONSTRUCTION work on the inclined retort systems for the Central Union Gas Company, of this city, is well underway. It is not believed, however, that the plants will be in working order until some time next spring.

New Reversible Pneumatic Drill.

The Chicago Pneumatic Tool Company, Fisher Building, Chicago, have put on the market a new reversible drill of the Little Giant type. This machine was designed primarily to meet the wants of those who required a drill for general use, but whose work was not sufficiently specialized to warrant the purchase of an exclusive reaming and tapping machine of this type.

The motor is of the same general construction as all those used by this Company, the distinguishing feature being four single acting pistons coupled to one crank shaft at an angle of 90°.

All moving parts are in an oil tight case and each pair of cylinders is controlled by one balanced piston slide valve. To this has been added a simple reverse valve so situated that it does not interfere with the feed screw when the machine is used as a simple drill.

The controlling lever may be removed from the motor when the reversible feature is not required. The machine can be controlled with the ordinary throttle, which is situated at the side. The reverse valve can be used as a throttle valve, however, when very rapid and accurate reverse motion is required, as would be the case if the motor were used in connection with machine for tapping to a given point or to bottom.

All the bearings are furnished with removable bushings. The crank journals have been increased 50 per cent. and the crank pinion is shrouded on both ends.

The upper and lower bearings for the crank shaft are of bronze. Oil plugs have been dispensed with and the oil is now poured in through the handle. A leather packed stuffing box is supplied to keep the oil from escaping.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,

PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,

EDITORS.

CHAS. E. SANDERSON,

MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT

No. 42 Pine Street, New York.

Telephone, 2996 John.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 Cents.

The JOURNAL is the official organ of the

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.
PACIFIC COAST GAS ASSOCIATION

Notification Respecting Advertising.—Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co. 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, JULY 28, 1902.

The Market for Gas Securities.

Light trading was reported for the week in local gas shares, but prices ruled firm. The closing quotation to-day (Friday) for Consolidated was 224 to 225. There is very little doing in the speculative line in Consolidated, and it may be taken for granted that the "short interest" therein is very slight. Local gas bond issues are all firmly held.

Brooklyn Union is inert as far as actual trading is concerned, and the nominal quotations are indicative of its strength. Before Christmas time the shares should easily bring 275.

Washington gas is 350, bid. The victors in the contest for control in the Consolidated Company, of Baltimore, have named the following executive management: President, Gen. F. C. Latrobe; First Vice-President, Chas. T. Crane; Second Vice-President, Ernst Schmeisser. Many progressive steps in the keeping up of the Company are promised by those in charge. We shall see. Peoples, of Chicago, spurted quite a bit during the week. It is now 105⅛ to 105½.

Lacledes are steady. The legal contention regarding Bay State drags its weary way, and the reorganization of the New England Gas and Coke Company's affairs is said to be progressing satisfactorily.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JULY 28.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	224	225
Central Union, Bonds, 5's	3,000,000	1,000	110	112
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	350	..
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.. Bonds, 5's	11,000,000	1,000	112½	113
Northern Union, Bonds, 5's.	1,250,000	1,000	108	110
New York and East River.. Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	109	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	..
Standard	5,000,000	100	130	140
Preferred	5,000,000	100	150	160
Bonds, 1st Mortgage, 5's	1,500,000	1,000	114	117
Yonkers	299,630	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	235	241
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	1¾	2
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	11	13
" " Bonds, 5's	5,250,000	1,000	83½	84½
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	.	.
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	20,500,000	100	103¾	108
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	108	109
Columbus (O.) Gas Lt. & Heating Co	1,682,780	100	88¾	89½
Preferred	3,026,500	100	107½	109
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	69	69¼
Mortgage, 6's	3,600,000	..	..	115
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	.	.	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	86	87
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	.	89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	382,000	1,000	77	79
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	.	.
" Bonds	2,000,000	..	58	63
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	70	80
" Bonds, 6's	2 650,000	..	102½	104½
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	89
Preferred	2,500,000	100	..	110
Bonds	10,000,000	1,000	109½	110
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	58	64
Louisville	2,570,000	50	112	120
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	107½	109½
" 6 per cent. scrip, due 1910	100,000	25	25	87
Montreal, Canada	2,000,000	100	182	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	1,000,000	25	300	325
Nashville Gas Lt. Co.	1,000,000	100	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	105⅛	105½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	48	48½
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	113½	115
General Mortgage, 5's	2,465,000	1,000	92	93
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	95	96½
Syracuse, N. Y.	1,975,000	100	24½	28
Bonds	2,047 000	1,000	86	90
Washington, D. C	2,800,000	20	350	355
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	109½	110
Wilmington, Del.	600,000	50	232	..

Advertisers' Index.

GAS ENGINEERS. Page

Wm. Henry White, New York City ... 139
Fred. Bredel, Milwaukee, Wis. ... 126
Geo. R. Rowland, New York City ... 126
The Western Gas Construction Co., Fort Wayne, Ind. ... 144
Humphreys & Glasgow, New York City ... 137
David Leavitt Hough, New York City ... 135
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 133
Baxter & Young, Detroit, Mich. ... 136
United Gas Improvement Co., Phila., Pa. ... 131
James T. Lynn, Detroit, Mich. ... 136
A. E. Boardman, Brevard, N. C. ... 136
The Jeffrey Manufacturing Co., Columbus, O. ... 134

GAS WORKS APPARATUS AND CONSTRUCTION.

Continental Iron Works, Brooklyn, N. Y. ... 138
Delly & Fowler, Phila., Pa. ... 140
Kerr Murray Mfg. Co., Fort Wayne, Ind. ... 136
Stacey Mfg. Co., Cincinnati, Ohio ... 139
Bartlett, Hayward & Co., Baltimore, Md. ... 137
Davis and Farnum Mfg. Co., Waltham, Mass. ... 136
R. D. Wood & Co., Phila., Pa. ... 138
Isbell-Porter Company, New York City ... 133
Fred. Bredel, Milwaukee, Wis. ... 126
United Gas Improvement Co., Phila., Pa. ... 131
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 133
The Western Gas Construction Co., Fort Wayne, Ind. ... 144
Humphreys & Glasgow, New York City ... 137
Logan Iron Works, Brooklyn, N. Y. ... 140
Riter-Conley Mfg. Co., Pittsburgh, Pa. ... 139
Baxter & Young, Detroit, Mich. ... 136
G. Shepard Page's Sons, New York City ... 136
James T. Lynn, Detroit, Mich. ... 136
A. E. Boardman, Brevard, N. C. ... 136
Christopher Cunningham, Brooklyn, N. Y. ... 134
The Jeffrey Manufacturing Co., Columbus, O. ... 134
Quintard Iron Works, New York City ... 133
The Connersville Blower Company, Connersville, Ind. ... 139
Lloyd Construction Co., Detroit, Mich. ... 126
Connelly Iron Sponge and Governor Co., New York City 127

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md. ... 137
United Gas Improvement Co., Phila., Pa. ... 131
Burdett Loomis, Hartford, Conn. ... 138
Economical Gas Apparatus Construct'n Co, Toronto, Ont. 133
The Western Gas Construction Co., Fort Wayne, Ind. ... 144
Humphreys & Glasgow, New York City ... 137
B. E. Chollar, St. Louis, Mo. ... 123

SCRUBBERS AND CONDENSERS.

R. D. Wood & Co., Phila., Pa. ... 138
Continental Iron Works, Brooklyn, N. Y. ... 138
Logan Iron Works, Brooklyn, N. Y. ... 140
Riter-Conley Mfg. Co., Pittsburgh, Pa. ... 139
The Western Gas Construction Co., Fort Wayne, Ind. ... 144

PRODUCER POWER PLANTS.

R. D. Wood & Co., Philadelphia, Pa. ... 138

TAR AND CARBONIC ACID EXTRACTOR.

The Western Gas Construction Co., Fort Wayne, Ind. ... 144

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich. ... 123
The Western Gas Construction Co., Fort Wayne, Ind. ... 144

GAS METERS.

John J. Griffin & Co., Phila., Pa..... 108
American Meter Co., New York and Philadelphia..... 143
Helme & McIlhenny, Phila., Pa..... 143
D. McDonald & Co., Albany, N.Y..... 141
Nathaniel Tufts Meter Co., Boston, Mass..... 142
Maryland Meter and Mfg. Co., Baltimore, Md..... 143
Metric Metal Co., Erie, Pa..... 143
Keystone Meter Co., Royersford, Pa..... 142
Detroit Meter Company, Detroit, Mich..... 143

PREPAYMENT METERS.

American Meter Co.. New York and Philadelphia,..... 143
John J. Griffin & Co., Phila., Pa..... 108
D. McDonald & Co., Albany, N. Y..... 141
Helme & McIlhenny, Phila., Pa..... 143
Nathaniel Tufts Meter Co., Boston, Mass..... 142
Keystone Meter Co., Royersford, Pa..... 142

GAS AND WATER PIPES.

M. J. Drummond & Co., New York City..... 128
R. D. Wood & Co., Phila., Pa..... 138
Warren Foundry and Machine Co., New York City..... 128
Donaldson Iron Co., Emaus, Pa..... 128
Christopher Cunningham, Brooklyn, N.Y..... 124
Charles Millar & Son Co., Utica, N. Y..... 128

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N.Y. City..... 138

GAS TAPPING MACHINES.

George Light, Dayton, O..... 128
H. Mueller Manufacturing Company, Decatur, Ills..... 125

GAS COALS.

Perkins & Co., New York City..... 134
Westmoreland Coal Co., Phila., Pa..... 133
Berwind-White Coal Mining Co., New York and Phila.. 134

CANNEL COALS.

Perkins & Co., New York City..... 134

CONVEYORS.

The Link-Belt Machinery Co., Chicago, Ills..... 135
The Western Gas Construction Co., Fort Wayne, Ind... 144
The Jeffrey Manufacturing Co., Columbus, O..... 134
C. W. Hunt Company, New York City..... 133

GAS ENRICHERS.

Standard Oil Co., New York City..... 99
The Sun Oil Co., Pittsburgh, Pa..... 135

COKE CRUSHERS.

C. M. Keller, Columbus, Ind..... 135
The Jeffrey Manufacturing Co., Columbus, O..... 134

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N.Y..... 133
The Connersville Blower Company, Connersville, Ind... 143

ECONOMIZERS.

Green Fuel Economizer Co., Matteawan, N.Y..... 125

GAS GAUGES.

The Bristol Co., Waterbury, Conn..... 134

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 127
Isbell-Porter Co., New York City..... 138
R. D. Wood & Co., Phila., Pa..... 138

CEMENTS.

C. L. Gerould, Galesburg, Ills..... 132

RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J..... 132
Adam Weber Sons, New York City..... 132
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 132
Cyrus Borgner, Phila., Pa..... 132
James Gardner, Jr., Co., Pittsburgh, Pa..... 132
Henry Maurer & Son, New York City..... 132
Baltimore Retort and Firebrick Co., Baltimore, Md..... 132
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 132
Brooklyn Firebrick Works, Brooklyn, N.Y..... 132
Missouri Firebrick Co., St. Louis, Mo..... 132

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md..... 137
Fred. Bredel, Milwaukee, Wis..... 126
J. H. Gautier & Co., Jersey City, N.J..... 132
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 132
Adam Weber Sons, New York City..... 132
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 132
Missouri Firebrick Co., St. Louis, Mo..... 132

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Co., New York City..... 138
Continental Iron Works, Brooklyn, N.Y..... 138
Logan Iron Works, Brooklyn, N.Y..... 140
R. D. Wood & Co., Phila., Pa..... 138
The Western Gas Construction Co., Fort Wayne, Ind.. 144

CHIMNEY CONSTRUCTION.

Adam Weber Sons, New York City..... 132

INCANDESCENT GAS LAMPS.

Welsbach Company, Gloucester, N. J..... 130
General Gas Light Company, Kalamazoo, Mich..... 125
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 123
Detroit Arc Gas Light Co., Detroit, Mich..... 123

BURNERS.

C. A. Gefrorer, Phila., Pa..... 123
Wm. M. Crane Co., New York City..... 125
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 123

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn..... 123

STREET LAMPS.

Welsbach Street Lighting Co., New York and Phila.... 130
Thos. T. W. Miner, New York City..... 143

PURIFIERS.

R. D. Wood & Co., Phila., Pa..... 138
Stacey Mfg. Co., Cincinnati, O..... 133
The Western Gas Construction Co., Fort Wayne, Ind... 144

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 127

VALVES.

Ludlow Valve Manufacturing Co., Troy, N.Y..... 125
R. D. Wood & Co., Phila., Pa..... 138
Continental Iron Works, Brooklyn, N. Y..... 138
The P. H. & F. M. Roots Co., Connersville, Ind..... 91
Isbell-Porter Co., New York City..... 138
The Western Gas Construction Co., Fort Wayne, Ind.... 144
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 136

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind..... 91
Isbell-Porter Company, New York City..... 138
Connelly Iron Sponge and Governor Co., New York City 127
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 136
The Connersville Blower Company, Connersville, Ind... 143

ELECTRICAL APPARATUS.

Wm. Henry White, New York City..... 139

BOILERS, STACKS, TANKS, ETC.

The Hazelton Boiler Company, Rutherford, N.J..... 128

PURIFIER SCREENS.

John Cabot, New York City..... 134

GAS STOVES.

American Meter Co., New York and Philadelphia..... 129
Maryland Meter and Manufacturing Co., Baltimore, Md 142
Keystone Meter Co., Royersford, Pa..... 142
Nathaniel Tufts Meter Co., Boston Mass..... 142

HOT WATER HEATERS.

The Humphrey Mfg. and Plating Co., Kalamazoo, Mich. 128

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N.Y..... 126

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md..... 137
Continental Iron Works, Brooklyn, N.Y..... 138
Delly & Fowler, Philadelphia, Pa..... 140
Davis & Farnum Mfg. Co., Waltham, Mass..... 136
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 136
Stacey Mfg. Co., Cincinnati, Ohio..... 139
R. D. Wood & Co., Philadelphia, Pa..... 138
Logan Iron Works, Brooklyn, N.Y..... 140
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 139

STORAGE TANKS.

Christopher Cunningham, Brooklyn, N.Y..... 124

INVESTORS.

W. R. Faben Construction Company, Toledo, O..... 123

BOOKS, ETC.

Scientific Books..... 124
Newbigging's Handbook..... 142
Field's Analysis, 1901..... 138
Gas Flow Computers..... 135
Excerpts from Reports of Gas Commissioners..... 107
Directory of Gas Companies..... 139
Gas Engineer's Laboratory Handbook..... 138
Gas Engineer's Pocket-Book..... 137
Poole on Fuels..... 135
Practical Photometry..... 140
Practical Handbook on Gas Engine..... 133
Hughes' "Gas Works"..... 128
Coal Tar Tree..... 136
Practical Hints on Regenerator Furnaces..... 132
Binders..... 135

POSITION WANTED

By a Gas Engineer and Draughtsman.

Experienced in gas works construction and operation; coal and water gas. Thoroughly practical. References.

1416-3 Address, "Q. G. C.," care this Journal.

Position Wanted

With Gas or Electric Company.

Correspondence desired with companies interested in the employment of manager for gas or electric company. At present, and for past 16 years, employed in office of combination company in city of 25,000 inhabitants. Recommendations furnished if desired. Address, P. O. BOX 1714,

1415-2 New York City.

Wanted, Position

—OF—

SUPERINTENDENT.

Correspondence solicited.

1415-3 Address, "A. J.," care this Journal.

POSITION WANTED

As Assistant Superintendent or Foreman

in water gas plant. Would prefer going west of the Mississippi, or on the Pacific Coast. Address, "A. B. C.,"

1416-2 Care this Journal.

POSITION WANTED AS MANAGER,

By a hustler for new business. Has experience in selling gas stoves; also in laying high and low pressure mains. Understands the manufacture of coal and water gas in detail. Experience in reconstruction of benches and water gas apparatus. Was superintendent of gas works for number of years. Now in charge of new business department of one of the largest gas companies in the Union. Will furnish all required references. Address, "G. L.,"

1414-4 Care this Journal.

Position Wanted.

YOUNG MAN, 32, eight years' continuous experience in all branches, desires position of superintendent or manager of coal gas plant. References.

1415-3 Address, "WANT," care this Journal.

WANTED,

Second-hand Station Meter,

from 60 to 72 inches diameter.

Four Purifying Boxes, 9 feet by 12 feet, or about that capacity.

1416-tf Address, G. M. ROSSMAN, Treas., Keene, N. H.

FOR SALE,

Five-foot Water Gas Apparatus,

Consisting of generator, carburetor, superheater, seal, scrubber, condenser; two (2) 15-horse power engines; two (2) blowers, wall brackets, countershaft, belting, etc.

Apply to CHARLES THOMAS,

1415-tf MAIN ST., FLUSHING, N. Y.

FOR SALE.

Apparatus for Complete Water Gas Plant,

Consisting of 5-ft. cupolas; purifying boxes, with center seal; engine, boiler, blower and holder.

Address, "P. R. R.,"

1405-tf Care this Journal.

FOR SALE.

FOUR PURIFIER BOXES,

Nine feet by 12 feet by 3 feet deep. Dry centerseal. Ten-inch connections. All in good condition. Low price.

Address,

THE GAS AND ELECTRIC COMPANY, OF BERGEN COUNTY,

1415-2 HACKENSACK, N. J.

FOR SALE.

250 Barrels of COAL TAR.

MADISON LIGHTING COMPANY,

1415-2 MADISON, IND.

GAS ENGINES FOR SALE.

Having made a change in our plant, we offer for sale

THREE OTTO GAS ENGINES,

of 50-horse power each; also, one starter. All in good condition. For terms, apply to

WILLIMANTIC GAS AND ELECTRIC LIGHT CO.,
1405-3m Willimantic, Conn.

IN THE MARKET.

WE PURCHASE:

Gas properties,
Electric light properties.
Street railway properties.
Also desirable franchises.

W. R. FABEN CONSTRUCTION CO.,
1383-tf 317 St. Claire Street, Toledo, O.

GAS BURNERS,

To burn a given amount at a stated pressure, made to order. Samples furnished. Also, small oil and air valves, slow-feed valves for high pressure, and small brasswork in general.

Drip Pumps, Service Cleaners, Gasfitters' Proving Pumps and Mercury Gauges.

C. GEFRORER & SON,
218 North 8th Street, Philadelphia, Pa.

INVENTIONS FOR EUROPE.

Engineers of standing and acquaintance in Europe are desirous of securing the handling of some good inventions abroad. We want such as will justify the organization of companies. Liberal propositions for the right articles.

ZERBE & ZERBE, Engineers.
1345-tf 11 Broadway, New York.

Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.

Ammonia Concentrator.

Not Expensive. Write to
STROH & OSIUS, Pat'ees, or
Mich. Ammonia Works, Detroit, Mich.

"THE MINER"

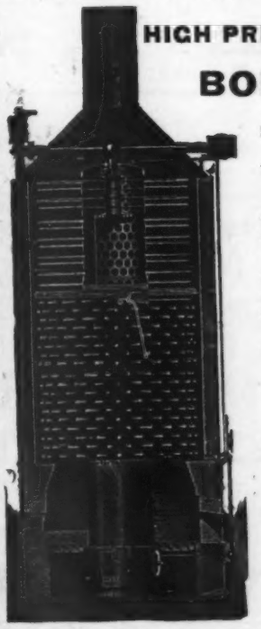
Globe
Street and Boulevard
Lamps.

Cheapest and Best.
THOUSANDS IN USE WITH INCANDESCENT BURNERS.
Send for Catalogues.

THOMAS T. W. MINER,
821-823 Eagle Av., N.Y.

HAZELTON WATER TUBE

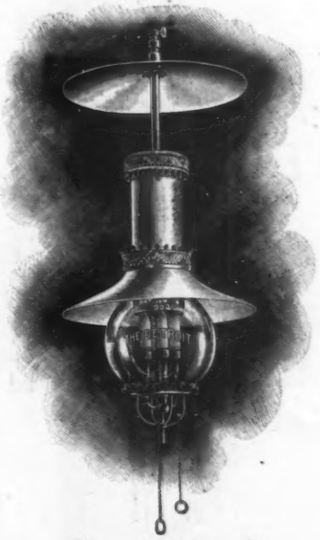
HIGH PRESSURE
BOILERS



have a high factor of safety without the use of thick, easily deteriorated plates. They are made to give the greatest service with the least necessity for renewed parts, and these are so subdivided that changes can be economically made. A Hazelton saves money. A trial will prove it.

THE
HAZELTON BOILER CO.,
RUTHERFORD, N. J., U. S. A.
Tele., 6M Rutherford.
Cable Address, "Palla," Rutherford.

The DETROIT



Force Draft
ARC GAS LAMP.

Durability,
Efficiency,
Simplicity,
Economy.

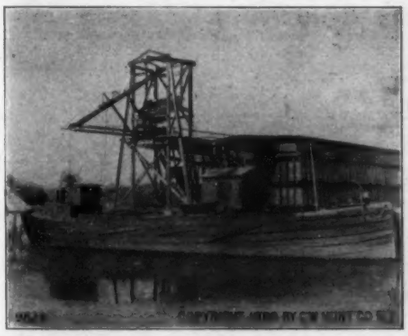
Perfect Combustion.
No Chimneys to Break.
No Matches Necessary.
Consumes Less Gas.
A Handsome Fixture
Always in Order.

Our lamp gives 25 per cent. ***more light*** with 20 per cent. ***less gas*** than any Arc Gas Lamp now on the market.

TO LIGHT CONSUMPTION WHAT THE GAS RANGE IS TO FUEL. : : : : :

SAMPLE ORDERS
Solicited.

Manufactured by
The Detroit Arc Gas Light Co.,
67 to 71 Michigan Avenue,
DETROIT, MICH.



No. 9824.
Taunton Gas Light Company, Taunton, Mass.

COAL HANDLING IN GAS WORKS.

We can supply complete Coal Handling installations, every piece of machinery being made in our works. We have been in this special line of business since 1872, and our coal handling machinery is in use in every port in America, and in almost every country in the world.

We shall be glad to receive plans and descriptions of proposed plants from parties desiring to make improvements, to which it will give us pleasure to reply, giving such information as it is in our power to do.

C. W. HUNT CO., WEST NEW BRIGHTON, STATEN ISLAND, N. Y.

Chollar's System of Gas Purification.

THE PURIFIED GAS REVIVES THE FOULED OXIDE.

STEWARD LAVA TIPS. ALL SIZES. ALL KINDS.

Greatest care is used in selection of material and making.

YOU CAN GET ANY QUANTITY PROMPTLY FROM OUR THREE BRANCHES.

THE D. M. STEWARD MFG. CO., ESTABLISHED 1876.

NEW YORK: 107 CHAMBERS STREET.
CHICAGO: 57 WASHINGTON STREET.
FACTORY AND GENERAL OFFICE: CHATTANOOGA, TENN.

CHRISTOPHER CUNNINGHAM,

PROPRIETOR,

THE NOVELTY STEAM BOILER WORKS,

BROOKLYN, N. Y.

STORAGE TANKS FOR GAS WORKS,

To Retain Fluid Material of Any Sort.

PIPING IN AND AROUND GAS WORKS.

Work Done for Several of the Largest Gas Companies in America Stands as Reference.

SCIENTIFIC BOOKS.

GAS MANUFACTURE, THE CHEMISTRY OF, by W. J. A. Butterfield. $3.

NEWBIGGING'S HANDBOOK. By Thos. Newbigging. 6th edition. $6.

COX'S GAS FLOW COMPUTER. $2.50.

FIELD'S ANALYSIS, 1901. $5.

HUGHES' GAS WORKS. $1.65.

POOLE ON FUELS. By Herman Poole. $3.

GAS ENGINEER'S POCKET-BOOK. By Henry O'Connor $3.50.

TECHNICAL GAS ANALYSIS. $3.

GAS CONSUMER'S HANDYBOOK, by Wm. Richards. 20 cents.

PRACTICAL TREATISE ON HEAT By Thomas Box. 2d edition. $5.

PRACTICAL PHOTOMETRY: A Guide to the Study of the Measurement of Light. By W. J. Dibdin. $3.

CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.

IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.

HEMPEL'S GAS ANALYSIS, $2.25.

LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.

COAL: Its History and Use. By Prof. Thorpe. $3.50.

PRACTICAL HANDBOOK ON GAS ENGINES, by G. Lieckfeld. $1.

HEAT A MODE OF MOTION. By John Tyndall. $2.50.

THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.

MANUAL FOR GAS ENGINEERING STUDENTS. By D. Lee. 40 cents.

AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2.

PRACTICAL HINTS ON REGENERATOR FURNACES. By M. Graham. $1.25.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $3.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.

ILLUMINATING AND HEATING GAS. By W. Burns. $1.50

HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.

TREATISE ON MASONRY CONSTRUCTION. Baker. $5

GAS ENGINEER'S LABORATORY HANDBOOK. By Jno. Hornby. $2.50.

GAS LIGHTING AND GAS FITTING. By W. P. Gerhard. 50 cents.

PRACTICAL PLUMBING. By P. J. Davies. $3.

AMERICAN PLUMBING. By Alfred Revill. $2.

CEMENT; A Manual of Lime and Cement, their Treatment and Use in Construction. By A. H. Heath. $2.50.

A COMPARISON BETWEEN THE ENGLISH AND FRENCH METHODS OF ASCERTAINING THE ILLUMINATING POWER OF COAL GAS. $1.60.

ELECTRICITY.

INDUSTRIAL PHOTOMETRY, with Special Application to Electric Lighting. By A. Palaz, Sc.D. $4.

ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.

ELECTRIC TRANSMISSION OF ENERGY. By G. Kapp. $3.50.

ELECTRICIAN'S POCKETBOOK. By Monroe and Jamieson. $2.50.

DYNAMO BUILDING. By F. W. Walker. 50 cents.

DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.

PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.

PRACTICAL GUIDE TO THE TESTING OF INSULATED WIRES AND CABLES. $1.

ELECTRIC LIGHTING, by Francis B. Crocker. $3.

ELECTRIC LIGHT FITTING. $2.

PRACTICAL ELECTRICITY. $2.50.

ELECTRICITY FOR ENGINEERS. $2.50.

ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague. $6.

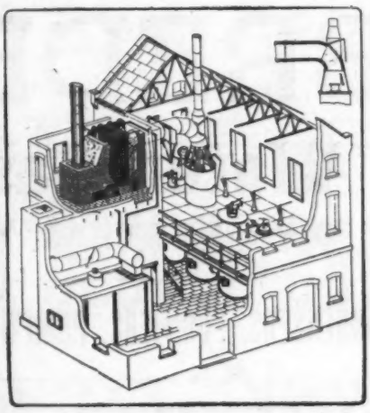
The above will be forwarded upon receipt of price. If sent by mail or express, postage or express charges must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order. No books sent C.O.D.

A. M. CALLENDER & CO., 42 Pine Street, New York.

Economize Heat in Water Gas Plants,

BY UTILIZING A

Green's Economizer,



To absorb the heat now going to waste when you blow through your superheater to heat the feed water for your boilers to the temperature of the steam. This is now being done at the Poughkeepsie Gas Works, Poughkeepsie, N. Y. : : : : :

Write for full particulars how this is accomplished, the saving effected, and the advantages gained, to the

GREEN FUEL ECONOMIZER CO.,
MATTEAWAN, N. Y.

Bray Burners

THE STANDARD OF MERIT
THE WORLD OVER.
MADE FOR LOW AND HIGH PRESSURE.
FORTY YEARS' EXPERIENCE.

William M. Crane Co.
1131-1133 Broadway, New York
SOLE AGENTS FOR THE UNITED STATES.

Mueller Sweated Joint Meter Connections.

B-604-K.

WHEN you build a gas plant you don't mould your own brick and saw your own lumber, do you?

How many gas men are penny wise about making other savings around the plant and yet are pound foolish in making their own meter connections!

Muelle Sweated Joint Connections are furnished in straight or bent meter couplings, with service, meter or union meter cocks, at figures that make it folly for a man to do his own work. Catalogue 3-B describes gas cocks and meter connections.

MADE ONLY BY
H. MUELLER MFG. CO.,
DECATUR, ILLS., U. S. A.

THE
Ludlow Valve Mfg. Co.,
TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",
—FOR—
Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue

THIS IS THE
HUMPHREY GAS ARC LIGHT,

The Best Light in the World

FOR LIGHTING

Stores, Churches, Halls or any large indoor areas.

Guaranteed to give a greater volume of light, better diffused and steadier than an electric arc.

A Complete Revolution in Gas Lighting.

A sample lamp sent on 30 days' trial to any Gas Company.

This lamp is thoroughly protected with both Mechanical and Design Patents. Imitation of this Design and Construction will be prosecuted.

Manufactured by the
General Gas Light Co.,
KALAMAZOO, MICH.

FRED. BREDEL, C.E.

Coal and Water Gas Plants.

OWN SYSTEM.

RECUPERATIVE FURNACES, WASHERS, CONDENSERS, PURIFIERS, PURIFYING MACHINES, COKE CONVEYERS, ETC.

SOLE UNITED STATES AGENT FOR

ARROL-FOULIS MECHANICAL CHARGING AND DRAWING MACHINES.

Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas.

GAS RETORTS AND SPECIAL BLOCKS AND FIREBRICK MANUFACTURED UNDER THE SUPERINTENDENCE OF MY OWN CHEMIST.

COMPLETE GAS WORKS

No. 118 Farwell Avenue, · Milwaukee, Wis.

Lloyd Construction Company,

GREENWOOD AVE. AND M. C. R. R.,

DETROIT, MICH.

MANUFACTURERS AND CONSTRUCTORS
OF GAS APPARATUS AND PLANTS.

"ON DECK"

in our **new factory,** with a complete line of **new machinery** of the latest designs and a complete line of **new patterns,** embodying the most approved construction of **Coal Gas** and **Lowe Water Gas Apparatus, Purifiers, Etc.**

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,

238 Java Street, Brooklyn, N. Y.

GEORGE R. ROWLAND,

Formerly with the Continental Iron Works.

Draughtsman and Constructing Engineer.

Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

Office, No. 245 Broadway, N. Y. City.

Coal Tar Genealogical Tree.

MR. T. VINER CLARKE, of London, England, having compiled a novel Chart or Map illustrating the various

CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR,

In the form of a Genealogical Tree, including all the products discovered to date, the total number amounting to near 700, offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, 3.50. Orders may be sent to

A. M. CALLENDER & CO.,
No. 42 Pine Street, New York City.

The Advertisement of the

P. H. & F. M. ROOTS CO., Mfrs. of Gas Exhausters, Blowers, etc.,

Connersville, Ind., - - - - 109 Liberty Street, New York City,

Occupies this Space Every Alternate Week.

Connelly Iron Sponge and Governor Co.,

395 Broadway, New York City.

TELEPHONE, 3033 Franklin. - - - CABLE ADDRESS, Governorco.

GEO. G. RAMSDELL, General Manager. S. F. HAYWARD, Treasurer.

MANUFACTURERS OF

CONNELLY

Automatic and Balance Governors,

Iron Sponge.

EASTERN AGENTS

P. H. & F. M. ROOTS CO.,

Exhausters and Exhauster Governors.

AGENTS FOR THE UNITED STATES,

JONAS DRAKE & SON

SYSTEM OF

Inclined Retorts.

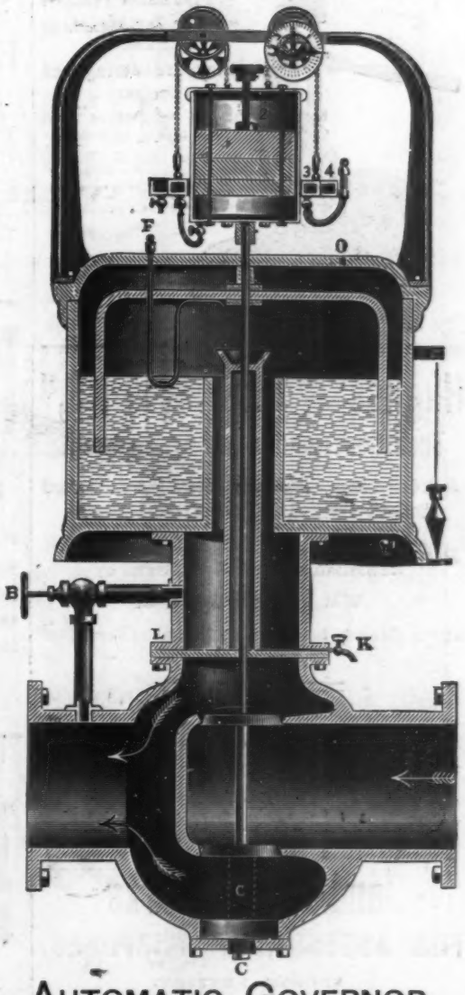
ZIMMER SWINGING CONVEYORS,

FOR HANDLING COAL OR COKE.

Jones Jet Photometer.

GAS SPECIALTIES.

CONNELLY'S



AUTOMATIC GOVERNOR.

MODEL OF 1900.

CONSTRUCTORS OF COAL GAS APPARATUS.

M. J. DRUMMOND & CO.

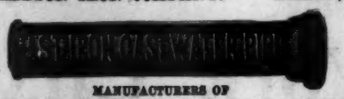
MANUFACTURERS OF CAST IRON FLANGE GAS AND WATER PIPE

GENERAL SALES OFFICE, 192 BROADWAY, NEW YORK.

GEORGE ORMROD, Manger. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa.

EMAUS PIPE FOUNDRY

DONALDSON IRON COMPANY. EMAUS, PA.



MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

GAS TAPPING MACHINES

—FOR—

Drilling and Tapping Pipe under Pressure

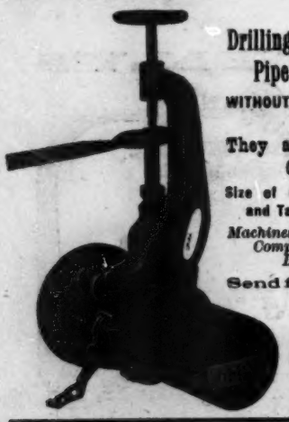
WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

Send for Circulars.



Geo. Light, DAYTON, O.

Hughes' "GAS WORKS,"

Their Construction and Arrangement,

And the Manufacture and Distribution of Coal Gas.

Originally written by SAM'L HUGHES, C.E.
Rewritten and Much Enlarged by
WM. RICHARDS, C.E.

Eighth Edition, Revised, with Notices of Recent Improvements.

Price, $1.65.

A. M. CALLENDER & CO., 42 PINE ST., N. Y. CITY.

THE

Valuation of Gas, Electricity and Water Works

FOR ASSESSMENT PURPOSES.

SECOND EDITION.

THOS. NEWBIGGING, M.Inst.C.E., and WM. NEWBIGGING, Assoc.M.Inst.C.E.

With an Appendix of Decided Cases.

Price $2. For Sale by

A. M. CALLENDER & CO.,
42 Pine Street, N. Y. City.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.

CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

CHARLES MILLAR & SON CO., Selling Agents, Utica, N.Y.

Flanged Pipe and Fittings, Hydrants, Gates, Pig Lead, Jute, etc.

UTICA PIPE FOUNDRY CO.

Manufacturers of Lead Pipe, Solder, etc., for Jobbers, Plumbers and Tinners' Goods.

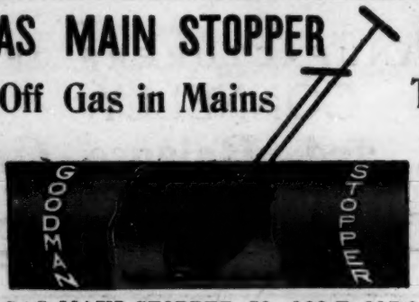
CAST IRON PIPE and SPECIALS FOR WATER AND GAS.

Wholesale Eastern Agents AKRON VITRIFIED SEWER PIPE.

SAFETY GAS MAIN STOPPER COMPANY,

For Shutting Off Gas in Mains

Any size gas main can be shut off in 30 seconds. : : :



Temporarily during alterations and repairs. : : : :

STOPPERS SENT ON TRIAL.

Address: SAFETY GAS MAIN STOPPER CO., 108 E. 117th St., New York City.

MOST GAS COMPANIES DO SELL, EVERY GAS COMPANY SHOULD SELL

Humphrey Crescent Instantaneous Water Heaters,

A LUXURY and NECESSITY.

This is Our No. 2 Heater.

Supplies hot water for domestic use as well as for the bath.

It Has No Equal

LIST PRICE NICKEL PLATED, $35.00,

including nickel plated shelf and brackets.

We have many styles, which range in price from our No. 10, at $45.00, to our No. 8, at only $20.00.

Every Heater Guaranteed.

SEND FOR CATALOGUE AND PRICES.

Will send heater on 60 days' trial to any Gas Company.

The Humphrey Manufacturing and Plating Company, KALAMAZOO, MICH., U. S. A.

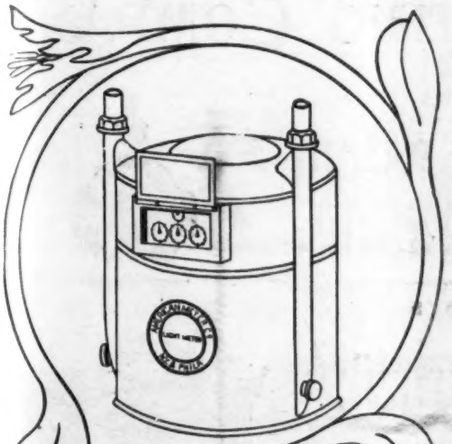
THE GAS ENGINEERS' POCKET-BOOK, By Henry O'Connor.

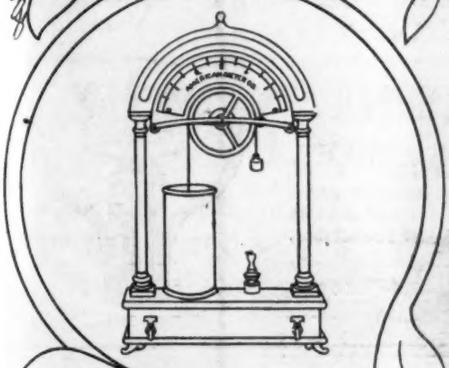
Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works. PRICE, $3.50.

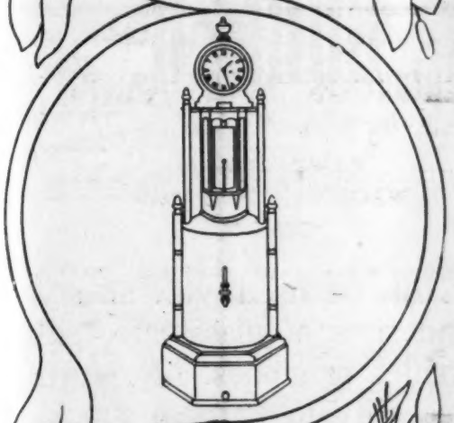
—FOR SALE BY—

A. M. CALLENDER & CO., 42 Pine Street, New York City.

(Copyrighted, 1894, by the AMERICAN METER CO.)







AMERICAN METER CO.

ESTABLISHED 1834. INCORPORATED 1863.

NEW YORK AND PHILADELPHIA,

CHICAGO, ST. LOUIS,

SAN FRANCISCO.

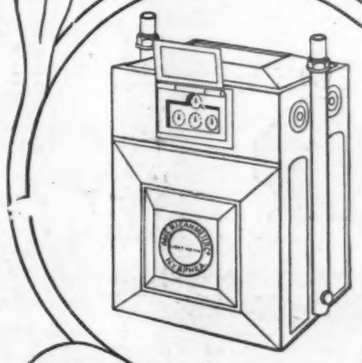
PUBLIC LIGHTING TABLE.

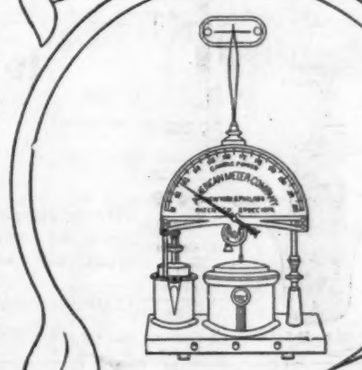
AUGUST, 1902.

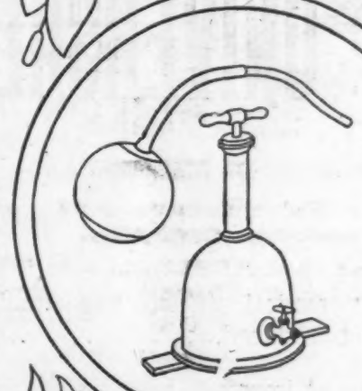
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Fri.	1	7.50 PM	4.00 AM	7.10	3.30
Sat.	2	7.50	4.00	7.10	3.30
Sun.	3	7.40 NM	4.00	7.10	3.30
Mon.	4	7.40	4.00	7.10	3.30
Tue.	5	7.40	4.00	7.10	3.30
Wed.	6	7.40	4.00	7.10	3.45
Thu.	7	7.40	4.00	7.10	3.45
Fri.	8	8.40	4.00	7.10	3.45
Sat.	9	9 20	4.00	7.10	3.45
Sun.	10	9.50 FQ	4.10	7.10	3.45
Mon.	11	10.30	4.10	7.10	3.45
Tue.	12	11.10	4.10	7.10	3.45
Wed.	13	12.00	4.10	6.55	4.00
Thu.	14	12.50 AM	4.10	6.55	4.00
Fri.	15	1.40	4.10	6.55	4.00
Sat.	16	2.40	4.10	6.55	4.00
Sun.	17	No L.	No L.	6.55	4.00
Mon.	18	No L. FM	No L.	6.55	4 00
Tue.	19	No L.	No L.	6.55	4.00
Wed.	20	7.20 PM	8.20 PM	6.45	4.10
Thu.	21	7.20	8.50	6.45	4.10
Fri.	22	7.20	9.30	6.45	4.10
Sat.	23	7.20	10.00	6.45	4.10
Sun.	24	7.10	10.40	6.45	4.10
Mon.	25	7.10 LQ	11.30	6.45	4.10
Tue.	26	7.10	12.20 AM	6 45	4.10
Wed.	27	7.10	1.20	6.30	4.20
Thu.	28	7.10	2.20	6.30	4.20
Fri.	29	7.10	4.20	6.30	4.20
Sat.	30	7.10	4.20	6.30	4.20
Sun.	31	7.00	4.30	6.30	4.20

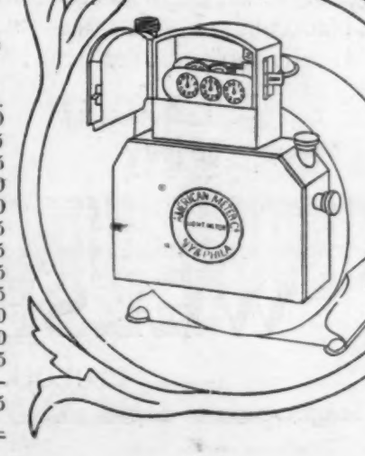
TOTAL HOURS LIGHTING DURING 1902.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	238.30	January	423.20
February	196.20	February	355.25
March	196.20	March	355.35
April	166.40	April	298.50
May	151.40	May	264.50
June	131.10	June	234.25
July	142.40	July	243.45
August	162.00	August	280.25
September	179.00	September	321.15
October	216.30	October	374.30
November	224.10	November	401.40
December	250.00	December	433.45
Total, yr.	2255.00	Total, yr.	3987.45





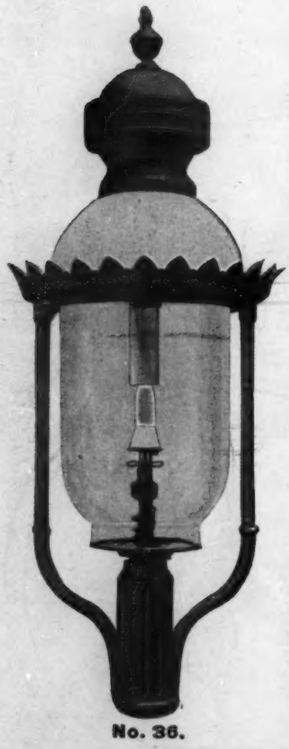




NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

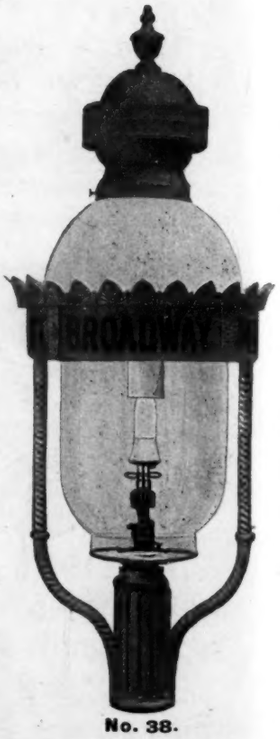
POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others Interested in Municipal and Outside Lighting.



No. 38.

UNIVERSAL WELSBACH BURNER.

The most practical, efficient and artistic burner yet produced. . . . . .

It contains an improved adjustable Bunsen so constructed as to permit of a wide range of variations in gas pressure without blackening the mantles and without an adjustable air shutter. . .

It can be used with all styles and sizes of glassware, either shades or globes. No further necessity to carry a stock of different burners for the many sizes and shapes of glassware.

GAS COMPANIES AND DEALERS CANNOT FAIL TO APPRECIATE THE MANY SALABLE FEATURES OF THIS NEW BURNER.

WELSBACH COMPANY,

GLOUCESTER, N. J. CHICAGO, ILLS.

Salesrooms in all the Leading Cities of the United States.

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

The capacity of apparatus installed, if operated continuously, is sufficient to make more than the entire amount of artificial gas annually sold in the United States.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

A. H. GUTKES, President. E. L. RICE, Vice-President. H. A. PERKINS, Secretary.

Brooklyn Fire Brick Works,

MANUFACTURERS OF

CLAY RETORTS, FIRE BRICK,
Gas House and other Tile.

Office, 88 Van Dyke St., Brooklyn, N. Y.

Established 1854. Incorporated 1869.

LACLEDE
Fire Brick Manufg. Co.,

Manufacturers of { GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Proprietors for the U. S., Coze System of Inclined Benches.

Estimates Furnished on Application for Most Successful Style of Construction.

Also for Free-Firing and Full and Half-Depth Regenerative Benches, for Burning either Coal or Coke in the Furnaces.

Office:
914, 915 & 916 Wainwright Building, St. Louis, Mo.

New Edition in Press. Soon to be Issued.
PRACTICAL HINTS ON THE
Construction and Working
—) OF (—
Regenerator Furnaces,
—) BY (—
MAURICE GRAHAM,
M. INST. C.E.

Price, $1.25. For Sale by
A. M. CALLENDER & CO.,
No. 42 Pine Street, New York City

Adam Weber Sons.

Manhattan Fire Brick and Enameled Clay Retort Works.

Works, Weber, N. J.

Main Offices Park Row Bldg., New York.

Modern Recuperative Furnaces.

Standard Fire Brick and Gas Retorts.

Designers and Builders of Chimneys of Perforated ..Radial Blocks..

ISAAC C. BAXTER, President.

Works,
LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR., CO.,

PETER YOUNG, Sec'y and Treas.

Address all communications to
JAMES GARDNER, JR., CO., Box 277,
JOHNSTOWN, PA.

Successor to WILLIAM GARDNER & SON,

Fire Clay Goods for Gas Works.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY
RETORT WORKS

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,
BENCH SETTINGS,
Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. Galesburg, Ills., or Buffalo, N. Y.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 300 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, Galesburg, Ills.

For orders East of Buffalo, N. Y., or Pittsburg, Pa., freight will be paid to these points.

Parker-Russell Mining and Mfg. Co.,

CITY OFFICE,
417 Pine Street, St. Louis, Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

Materials for Gas Companies

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec.
A. LAMBLA, Vice-Prest. and Supt.

BALTIMORE RETORT & FIRE BRICK CO.

MANUFACTORY AT
LOCUST POINT, BALTIMORE, MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.

Our Improved Half and Full Depth Benches have been Adopted by Many Gas Companies.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

JOHN DELL,
President and General Manager.

MISSOURI FIRE BRICK CO.,

ESTABLISHED 1882.

—MANUFACTURERS OF—

Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.

We are the **Exclusive Agents** *for the* **Mitchell Patent Benches,** *Constructed with Half or Full Depth Furnaces, to Burn either Coal or Coke, and Arranged for Front or* **Rear Clinkering.** **The Mitchell** *is the* **Original Coal Firing Bench.** *We also Erect Plain Benches with* **One** *to* **Six Retorts.**

YOUR CORRESPONDENCE IS RESPECTFULLY SOLICITED.

City Office:
411 Olive Street,
Continental Bank,
ST. LOUIS, MO.

QUINTARD IRON WORKS,
N. F. PALMER,
Foot of 12th St. & East River, New York,
MANUFACTURERS OF
GAS APPARATUS.
Complete Works Erected.
FREDERICK W. FLOYD, Engineer.

Newbigging's Handbook for Gas Engineers and Managers,
By THOMAS NEWBIGGING, M.Inst.C.E.
Price, $6. For Sale by
A. M. CALLENDER & CO.,
42 Pine St., N. Y. City.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED,
Engineers and Builders of water and coal gas apparatuses and general gas works machinery. : : :
AMERICAN OFFICES:
269 Front Street, East Toronto, Ont.
LONDON OFFICES:
19 Abingdon St., Westminster, S. W.
CABLE ADDRESS:
"CARBURETED" LONDON AND TORONTO.

Parson's Steam Blower
FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.
PARSON'S TAR BURNER,
FOR USING COAL TAR AS FUEL.
PARSON'S AIR JET TUBE CLEANER,
FOR CLEANING BOILER TUBES.
These devices are all first-class. They will be sent to any responsible party *for trial.* No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.
H. E. PARSON, Supt., 457 Putnam Ave., Brooklyn, N. Y.

PRACTICAL HANDBOOK ON
GAS ENGINES,
With Instructions for Care and Working of the Same.
By G. LIECKFELD, C.E.
Translated with Permission of the Author, by GEO. M. RICHMOND, M.E.
PRICE, $1.00.
A. M. CALLENDER & CO., 42 Pine Street, New York City.

FIELD'S ANALYSIS
For the Year 1901.
An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the 33d Year of Publication. Compiled and Arranged by
JOHN W. FIELD,
Secretary and General Manager of The Gas Light and Coke Company, London.
Price $5. For Sale by
A. M. CALLENDER & CO. - No. 42 Pine Street N. Y. City.

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

Ocean Mine Youghiogheny Gas Coal,
Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully prepared.
For Gas Making or
Heavy Steaming.

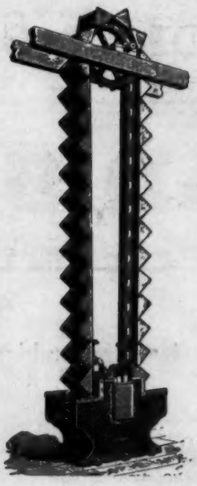
PURIFIER TRAYS SCRUBBER

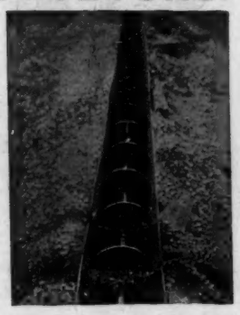
John Cabot,
553-557 W. 33d St., New York.

Bristol's Recording
PRESSURE GAUGE.
For continuous records of
Street Gas Pressure.
Simple in construction, accurate in operation and low in price.
Fully Guaranteed. Send for Circulars.
THE BRISTOL CO.,
Waterbury, Conn.

Silver Medal, Paris Exposition.

TYPES OF **JEFFREY**
ELEVATORS AND CONVEYORS.





SEND FOR CATALOGUE.

ADDRESS,
The Jeffrey Mfg. Co.,
Columbus, O.
New York,
Chicago,
St. Louis,
Denver,
Buffalo,
Philadelphia,
Kansas City, Mo.

The Gas Engineer's Laboratory Handbook,
By JOHN HORNBY, F.I.C. Price, $2.50.
Orders may be sent to
A. M. CALLENDER & CO., 42 Pine St., N. Y.

KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

Do You Wish to Know

what size of pipe to use to convey any quantity of gas, any distance, with any loss of pressure and any initial or final pressure? Then use

Cox's Gas Flow Computer,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50. For sale by

A. M. Callender & Co., 42 Pine St., N. Y.

POOLE ON FUELS.

THE CALORIFIC POWER OF FUELS.

By HERMAN POOLE, F.C.S.

Second Edition. Price, $3. For Sale by

A. M. CALLENDER & CO., 42 Pine St., N.Y. City.

BINDER for the JOURNAL.

Price, $1.00.

A. M. CALLENDER & CO., 42 Pine Street, N Y

Edmund H. McCullough, President. Chas. F. Godshall, Treasurer. H. C. Adams, Secretary. Henry Wharton, Assistant Secretary.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J.,
WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

THE LINK-BELT MACHINERY CO.,

ENGINEERS, FOUNDERS, MACHINISTS,
Chicago, U. S. A.

"Link-Belt" Breaker.

Tilting Coal and Coke Cars, Breaker Rolls, Power Transmitting Machinery.

LINK-BELT ELEVATING & CONVEYING MACHINERY for HANDLING COAL, COKE, OXIDE, ETC.

Machinery designed and erected to suit existing conditions and available space.

Special Catalogue No. 31 Sent upon Application.

PHILADELPHIA, LINK-BELT ENGINEERING CO.

THE SUN OIL CO.

Crude Oil, Gas Naphtha,
Refined Petroleum, Gas Oil.

Toledo, O., and Pittsburgh, Pa.

Coal Tar Genealogical Tree

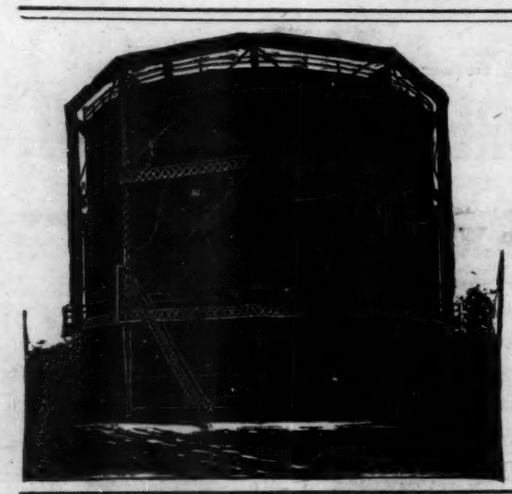
MR. T. VINER CLARKE, of London, Eng.,

Having compiled a novel Chart or Map illustrating the various

CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR,

in the form of a Genealogical Tree, including all the products discovered to date (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

A. M. CALLENDER & CO., - - No. 42 Pine Street, New York.



DAVIS & FARNUM MFG. CO.,
WALTHAM, MASS.

Principal Office & Works, Waltham, Mass. Boston Office, R'm 18, Vulcan Bldg., 8 Oliver St.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

Coke Borrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

BAXTER & YOUNG,
CONTRACTING AND CONSULTING GAS ENGINEERS.

Examination and Values Ascertained of Artificial and Natural Gas Properties.

COMPLETE GAS WORKS ERECTED.

Artificial and Natural Gas Mains Furnished and Laid.

GAS PROPERTIES PURCHASED.

OFFICE: WAYNE COUNTY BANK BUILDING, Rooms 201 & 202. DETROIT, MICH.

A. E. BOARDMAN, C. E.,
Consulting and Contracting Engineer.

Particular attention given to Gas, Water and Electric Plants. Long and successful experience with the problem and practice of

Filtration for Public Water Supply.

BREVARD, N. C.

JAMES T. LYNN,
GAS ENGINEER AND CONTRACTOR,

Wayne Bank Building, - DETROIT.

GAS PROPERTIES PURCHASED.

Geo. Shepard Page's Sons.
GAS MACHINERY.

Correspondence Solicited.

180 Fulton Street, New York City.

DAVID LEAVITT HOUGH,
Consulting Engineer AND CONTRACTOR,

PARK ROW BUILDING, N. Y.

KERR MURRAY MANUFACTURING CO.

Latest Design Rotary Exhauster, With Automatic Governor,

Single or Double-Lift Gasholders,

WITH OR WITHOUT STEEL TANKS.

Storage Oil Tanks, Condensers and Scrubbers.

Purifying Boxes, with Cover-Lifting Apparatus, Center Seal or Valve System Connections and Oxide Elevator.

REVERSIBLE WOOD PURIFYING AND SCRUBBING TRAYS.

Mouthpieces, Standpipes, Etc.; in Fact, All Classes of Ironwork for Benches.

DOUBLE GATE ALL IRON GAS VALVES, 3 TO 36 INCHES DIAMETER.

ALL SIZES OF STREET SPECIAL CASTINGS.

FORT WAYNE, IND.

BARTLETT, HAYWARD & CO.

BALTIMORE, MD.

Triple, Double and Single-Lift Gasholders.

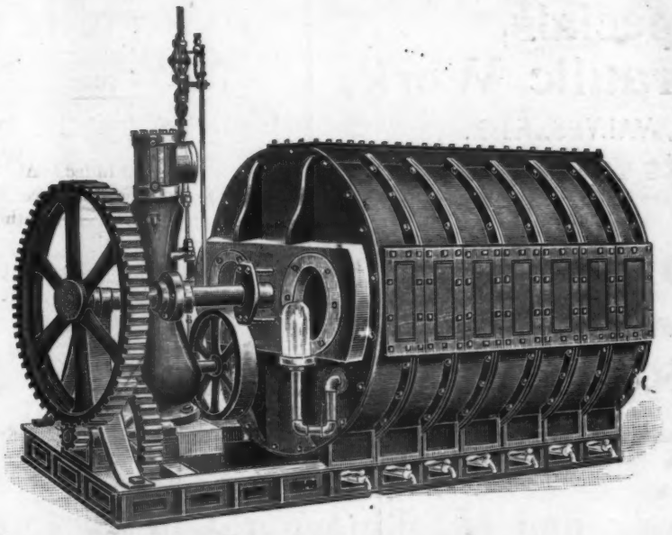
Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS

PURIFIERS.



CONDENSERS.

Scrubbers.

Bench Castings.

OIL STORAGE TANKS.

Boilers.

PATENT STANDARD WASHER-SCRUBBER.

The best apparatus for the extraction of all Ammonia and a large proportion of Carbonic Acid and Sulphureted Hydrogen. The Scrubber has been materially improved and is provided with patented Wooden Segmental Grids, instead of Metallic Discs, thus reducing the weight on shaft and power for operating same.

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSABLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

MILL'S REVERSIBLE LIME TRAYS.

Gas Works Designed and Constructed.

The Gas Engineer's Pocket-Book,

By HENRY O'CONNOR.

Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works.

PRICE, $3.50.

A. M. CALLENDER & CO. 42 Pine Street, New York City.

ALEX. C. HUMPHREYS, M. E., M. Inst. C. E. ARTHUR G. GLASGOW, M. E., M. Inst. C. E.

HUMPHREYS & GLASGOW,

BANK OF COMMERCE BLDG., 31 Nassau Street, New York.

38 VICTORIA STREET, London S. W., England.

CONSULTING GAS AND ELECTRIC LIGHT ENGINEERS.

PROPERTIES PURCHASED.

COMPLETE EXAMINATIONS MADE.

R. D. WOOD & CO.,

400 CHESTNUT ST., PHILADELPHIA,

MANUFACTURERS OF

Cast Iron Pipe.

HEAVY LOAM CASTINGS,

Dunham Specials,

Hydraulic Work,

LAMP POSTS, VALVES, ETC.,

Gas Power Plants with Producers.

BUILDERS OF

Gasholders.

Single, Double and Triple Lifts, with or without Metal Tanks.

PURIFIERS, CONDENSERS, SCRUBBERS, BENCH WORK.

Cutler's Patent Freezing Preventer for Holder Cups.

ISBELL-PORTER CO.,

ENGINEERS AND CONTRACTORS FOR THE

Construction and Extension of Gas Works.

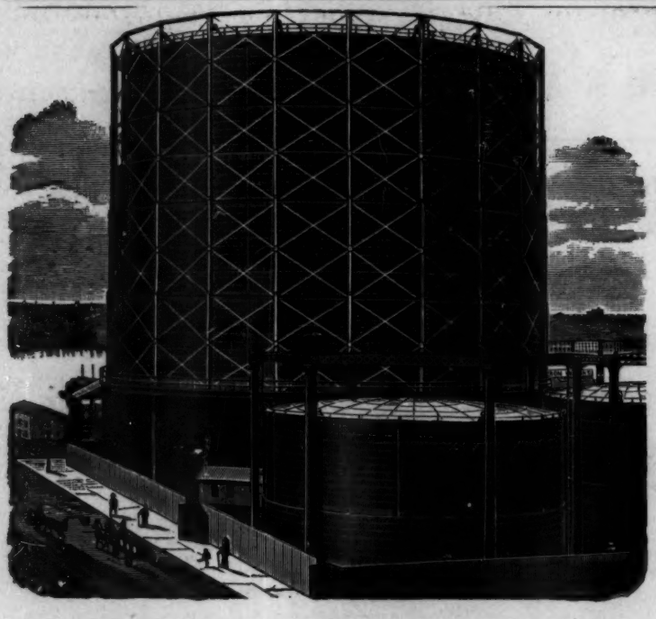
FOUNDERS AND MACHINISTS.

MANUFACTURERS OF

All Ironwork and Machinery Required in a Gas Plant.

Estimates, Drawings and Specifications furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

245 Broadway, New York City. OFFICES **Bridge & Ogden Sts., Newark, N. J.**



The Continental Iron Works,

THOMAS F. ROWLAND, President.
WARREN E. HILL and CHAS. H. CORBETT, Vice-Presidents.
THOMAS F. ROWLAND, Jr., Secretary & Treasurer.

West and Calyer Sts. (Near 10th & 23d St. Ferries)
NEW YORK, Borough of Brooklyn.

BUILDERS OF

Gas Holders.

Single and Multiple Section Gas Holders a Specialty.

STEEL GAS HOLDER TANKS.

BENCH CASTINGS, RETORT LIDS.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, Etc.

Self-Sealing Retort Mouthpieces & Lids

For Round, Oval, or "D" Retorts.

ILLUMINATING GAS! FUEL GAS!

THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cuttlery Co., Turner's Falls, Mass., and Henry Disston's Son's Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Plans and Estimates Furnished.

BURDETT LOOMIS, - - Hartford, Conn.

The Gas Engineer's Laboratory Handbook,

By JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 42 Pine St., N. Y. City.

THE STACEY MANUFACTURING CO.,

CONTRACTORS FOR THE ERECTION OF COMPLETE WORKS.

GAS WORKS APPARATUS.

GASHOLDERS

WITH AND WITHOUT

STEEL TANKS.

OIL TANKS, WATER TANKS, AND GENERAL WROUGHT AND CAST IRON WORK.

OFFICES:

No. 239 Mill Street, CINCINNATI, OHIO. 'Phone, West 690.

PLANS, SPECIFICATIONS AND ESTIMATES CHEERFULLY FURNISHED.

RITER-CONLEY MFG. CO.,

GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

GENERAL OFFICE: Pittsburg, Pa. EASTERN OFFICE: 39-41 Cortlandt St., New York City.

WM. HENRY WHITE,

No. 62 Wall Street, - - - New York City,

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

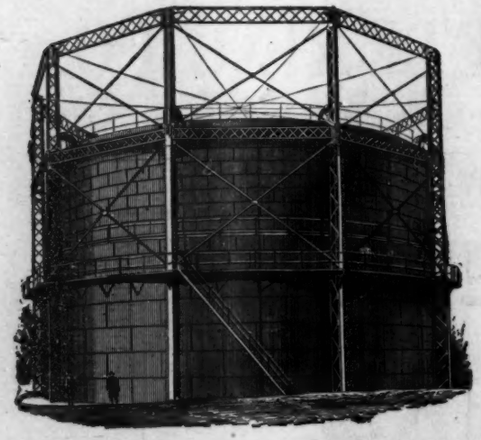
Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited.
Plans and Estimates Furnished.

1902 DIRECTORY 1902

OF AMERICAN GAS COMPANIES.

Price, - - - - - - - - - $5.00.

A. M. CALLENDER & CO., - - No. 42 Pine Street, New York.



1842 ※ Deily & Fowler, ※ 1902

LAUREL IRON WORKS.

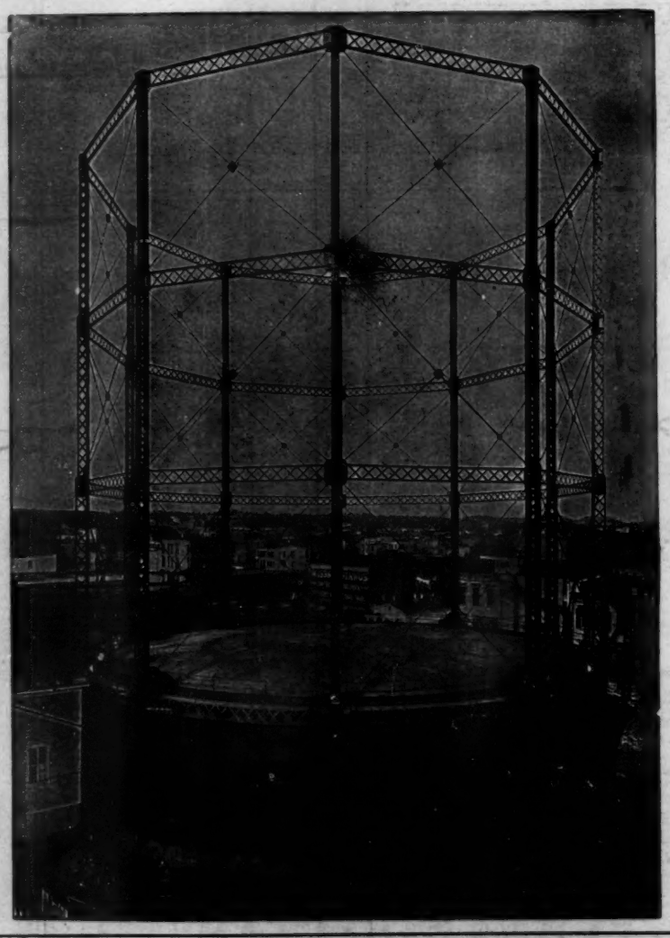
Office, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

Gasholders

Single or Telescopic. With or Without Iron or Steel Tanks.

OIL TANKS, WATER TANKS, AND GENERAL WROUGHT IRON WORK.



The order for this Triple-Lift Holder and Steel Tank was received by the Logan Iron Works from the Union Gas Light Company, of East New York. The contract was completed and the Holder was in actual use in 90 days from receipt of order. Capacity of Holder, 500,000 Cu. Ft.

LOGAN IRON WORKS,

Brooklyn, N. Y.

MANUFACTURERS OF

Single or Multiple-Lift

GASHOLDERS,

Complete with Steel Tanks.

BENCHES, SCRUBBERS,

CONDENSERS,

PURIFIERS, IRON ROOFS,

Self-Sealing Retort Lids,

AND ALL PARTS OF

GAS WORKS APPARATUS.

Contractors for Complete Works.

ALSO, SOLE MANUFACTURERS OF

C. W. BLODGET'S

HOT GAS SCRUBBER.

PRACTICAL PHOTOMETRY,

A GUIDE TO THE STUDY OF THE MEASUREMENT OF LIGHT.

By WILLIAM JOSEPH DIBDIN.

With Numerous Illustrations. Price, $3.00.

A. M. CALLENDER & CO., 42 Pine Street, New York City.

Established 1854.

D. McDONALD & CO.,

MANUFACTURERS OF

WET AND DRY METERS, STATION METERS AND METER PROVERS.

ALSO MAKERS OF

THE GLOVER PREPAYMENT METER.

The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.

The gas registered agrees absolutely with the amount purchased by the coin.

WE HAVE MADE AND SOLD IN THE UNITED STATES

OVER 70,000 OF THESE METERS,

ALL OF WHICH ARE GIVING PERFECT SATISFACTION.

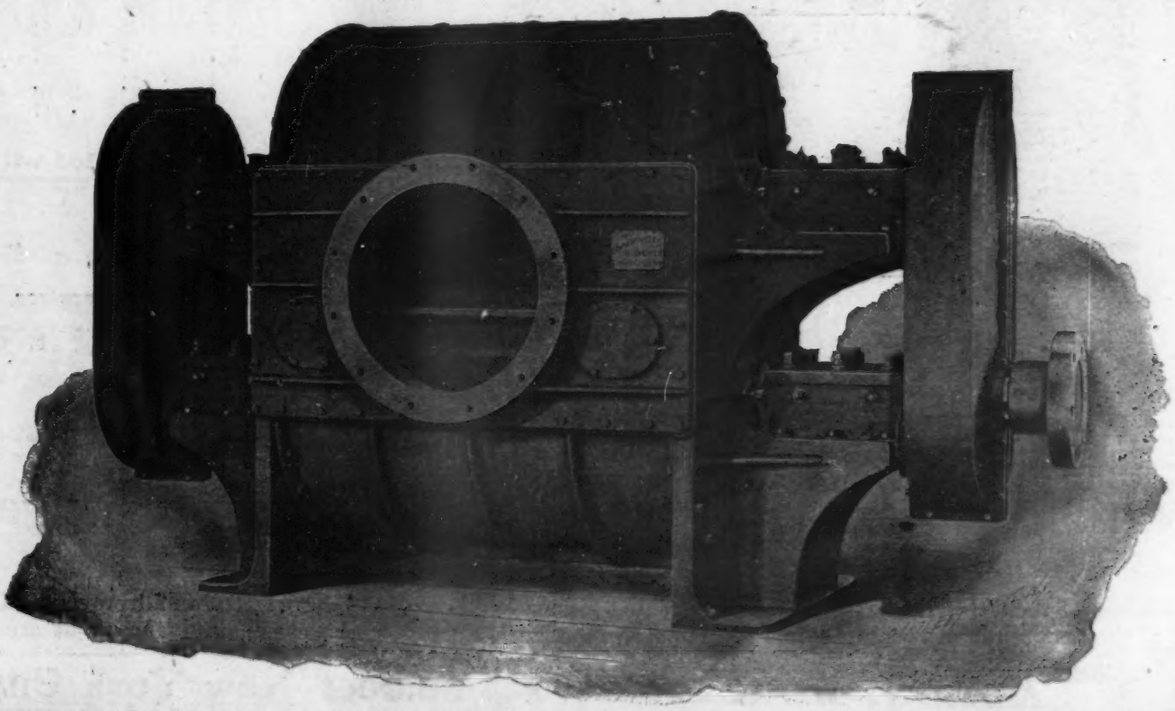
Correspondence Solicited.

561 West Forty-seventh Street, NEW YORK. | 51, 53 & 55 Lancaster Street, ALBANY, N. Y. | 34 & 36 West Monroe Street, CHICAGO.

THE CONNERSVILLE BLOWER CO.,

MANUFACTURER OF

ROTARY POSITIVE PRESSURE GAS EXHAUSTERS, BLOWERS AND PUMPS.



HORIZONTAL OR VERTICAL, IN CAPACITY RANGING FROM 9,000 to 1,800,000 CU. FEET DISPLACEMENT PER HOUR.

CONNERSVILLE BLOWER CO., Connersville, Ind. EASTERN SALES OFFICE: 95-97 Liberty St., New York City.

Established 1849. With the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

NATHANIEL TUFTS METER CO.,

8 Medford Street, Boston, Mass.

MANUFACTURERS OF

DRY GAS METERS.

Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges.

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Prepayment Gas Meters.

MARYLAND METER CO.,

BALTIMORE, North and Saratoga Streets. CHICAGO, 88 to 92 Jackson Boulevard.

CONSUMERS' AND STATION METERS, PRESSURE GAUGES, ETC.

SPECIAL ATTENTION GIVEN TO ALL REPAIR WORK.

"Have you Seen our Complaint Meter?"

THE KEYSTONE PREPAYMENT

IS

An Accurate Registrar,
A Sure Shut-off,
An Ideal for Easy Adjustment,
A Model of Simplicity,
A Paragon of Excellence, and
A Mighty Good All-round Meter.

Get Acquainted with it.

Keystone Meter Co., ROYERSFORD, PA.

WIESTER & CO., 22 Second Street, San Francisco, Cal.

NOW READY.

THE SIXTH (AND CENTENARY) EDITION

— OF THE —

Handbook for Gas Engineers and Managers.

By THOMAS NEWBIGGING, M. Inst. C.E.

This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions. Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry.

PRICE, - - $6.00.

A. M. CALLENDER & CO., - - No. 42 Pine Street, N. Y. City.

AMERICAN METER COMPANY,

NEW YORK, PHILADELPHIA, SAN FRANCISCO.

PREPAYMENT METERS.

THEIR CONSTRUCTION IS SUCH THAT THEY MAY BE READILY READJUSTED WHEN THE SCALE OF GAS RATES IS CHANGED.

HELME & McILHENNY,

Established 1848. 1339 to 1349 Cherry Street, Philadelphia, Pa.

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

METRIC METAL COMPANY,

MAKERS OF

GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.

This is the best time to look after your repairing.

Seventy per cent. of old meters run slow. You are losing money on them. Let us put them in shape for you, a few at a time, until your entire meter equipment is made as good as new. It is better to attend to this matter now, before the Gas Stove season is at its height. Probably we can do such work in our factory better and cheaper than you can do it at home, and just now we can do it promptly.

The BUHL METERS are as good Meters as you can get.

DETROIT METER COMPANY, - - Detroit, Mich.

Advertisement of

JOHN J. GRIFFIN & CO., Mfrs. of Gas Meters, etc.,

Nos. 1513, 1515, 1517, 1519 & 1521 Race Street, Philadelphia,

559 West 47th Street, New York, 34 West Monroe Street, Chicago,

Occupies this Space Every Alternate Week.

THE WESTERN GAS CONSTRUCTION CO.,

NEW YORK, - - Park Row Building.
SAN FRANCISCO, 137 Montgomery St.

MAIN OFFICE AND WORKS, **FORT WAYNE, IND.**

GAS PURIFICATION

BY MEANS OF

THE CHOLLAR SYSTEM

AND OUR

DUPLEX REVERSING VALVE AND PURIFIERS.

Smaller Space. : : : : : Less Cost. : : : : : : Longer Runs.

Sole Manufacturers of

THE C. R. FABEN, JR., PATENT PURIFIER TRAYS.

FOR PURIFIERS OF ANY DESIGN.

ECONOMICAL. DURABLE. EFFICIENT. NOVEL.

BUILDERS OF THE MOST IMPROVED

COAL and WATER GAS APPARATUS.